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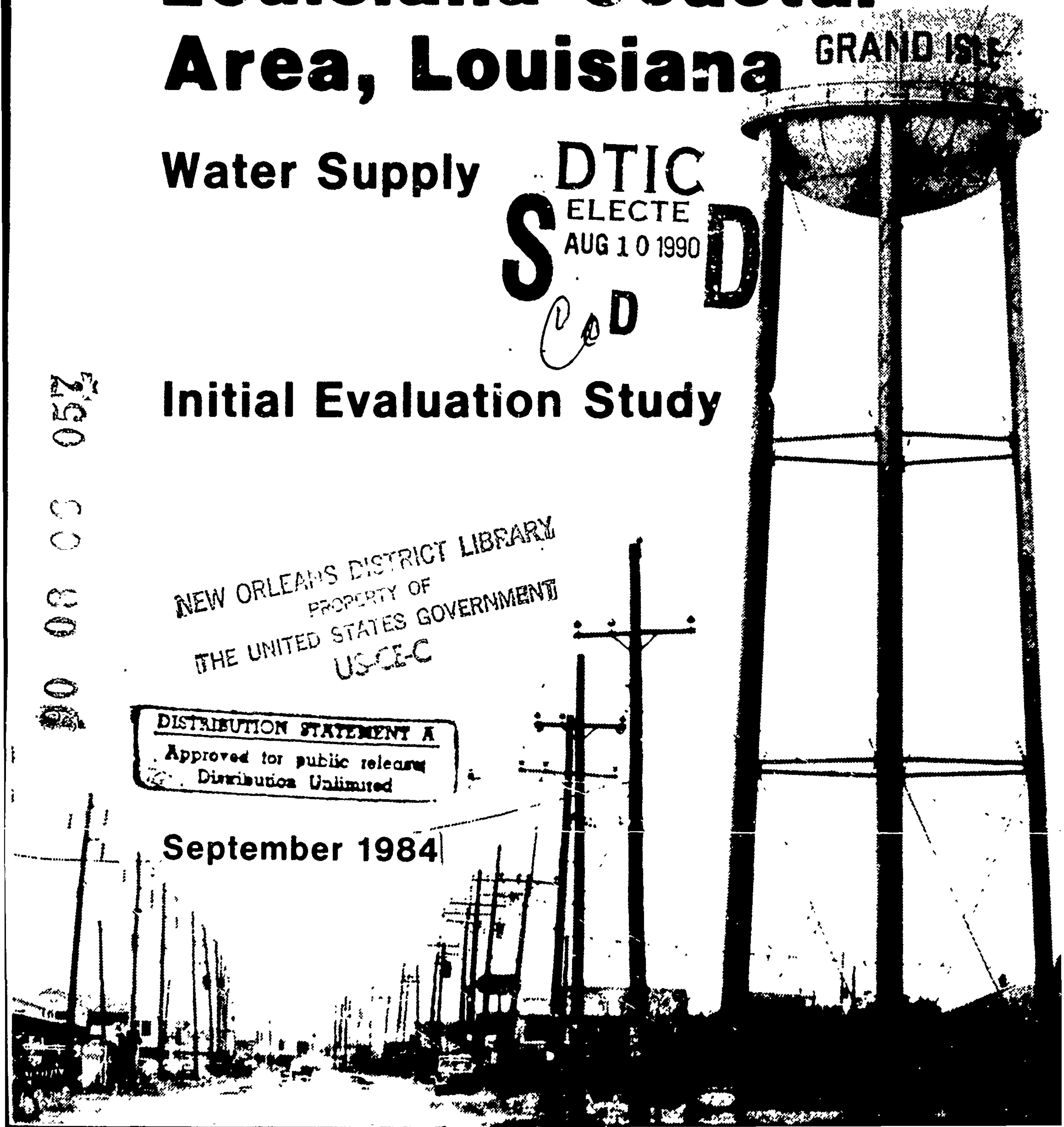
Notice of Study Findings

AD-A225 281

Louisiana Coastal Area, Louisiana



Water Supply

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Initial Evaluation Study

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September 1984

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If you have any questions or need additional information, please contact Mr. Norman Haydel, Study Manager, U.S. Army Corps of Engineers, New Orleans District, P.O. Box 60267, New Orleans, Louisiana, 70160-0267, telephone (504) 838-2543.

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REPLY TO
ATTENTION OF

LMNPD-P

September 1984

LOUISIANA COASTAL AREA, LOUISIANA

INITIAL EVALUATION REPORT

ON

WATER SUPPLY

SYLLABUS

This report presents the results of an initial evaluation to determine the advisability of improvements or modifications of existing improvements in the coastal area of Louisiana in the interest of water supply.

The study area includes all lands subject to tidal overflow in 20 coastal parishes. In 1980, the population of the area was about 2,077,934 and is projected to increase to 3,045,000 by the year 2040. Water supply withdrawals in the study area were nearly 11 billion gallons per day in 1980, 87 percent was from surface water sources. Major surface water sources in the study area besides the Mississippi River are the Gulf Intracoastal Waterway, the Mermentau River, the Calcasieu River, and Bayou Lafourche.

Some 39 square miles of land are lost each year to subsidence and erosion, and that rate is projected to increase. As the marshlands are converted to open water, the opportunity for saltwater intrusion are greatly increased. Current water supplies are frequently subject to saltwater intrusion and a number of coastal communities are seeking alternative sources of fresh water.

Six problem areas were identified and twenty-seven alternative plans were developed. From a preliminary analysis of cost and impacts, twelve plans were recommended for further study. Five of the six water supply problem areas should be investigated in interim studies under the Louisiana Coastal Area Study. The sixth, Mermentau River Basin, is closely related to the Grand and White Lakes Management Study, Louisiana, presently underway and could best be accomplished with that study.

The total study cost for the five studies, including the initial evaluation cost, is $3,800,000. The first study would be complete by the end of fiscal year 1987. (EDC)

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LOUISIANA COASTAL AREA, LOUISIANA

INITIAL EVALUATION REPORT
ON
WATER SUPPLY

This report presents the findings of studies to determine the advisability of improvements or modification of existing improvements in the coastal area in the interest of water supply.

Louisiana's barrier islands and coastal marshes protect fresh water sources from the intrusion of saltwater. These natural barriers are being converted to open water at a rate of about 40 square miles per year and the rate is projected to increase. As the marshlands are converted to open water, more avenues are created for the intruding saltwater. Current supplies of fresh water are frequently subject to saltwater intrusion and some of the coastal communities are seeking alternative sources of fresh water. In the study, available data were gathered to establish existing conditions, determine the water supply problems and needs of the area, and develop a wide range of alternative solutions. The data were assessed to identify the need for more detailed studies.

STUDY AUTHORITY

Study of the Louisiana coastal area was authorized by resolutions of the Committees on Public Works of the U.S. Senate and House of Representatives. The Senate resolution was sponsored by Senator Russell B. Long and the late Senator Allen J. Ellender and adopted on 19 April 1967. The resolution reads:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby requested to review the reports of the Chief of Engineers on the Mermentau River and Tributaries and Gulf Intracoastal Waterway and connecting waters, Louisiana, published as Senate Document Numbered 231, Seventy-ninth Congress, on the Bayou Teche, Teche-Vermilion Waterway and Vermilion River, Louisiana, published as Senate Document Numbered 93, Seventy-seventh Congress, on the Calcasieu River salt water barrier, Louisiana, published as House Document Numbered 582, Eighty-seventh Congress, and on Bayous Terrebonne, Petit Caillou, Grand Caillou, DuLarge, and connecting channels, Louisiana, and the Atchafalaya River, Morgan City to the Gulf of Mexico, published as House Document Numbered 583, Eighty-seventh Congress, and other pertinent reports including that on Bayou Lafourche and Lafourche-Jump Waterway, Louisiana, published as House Document Numbered 112, Eighty-sixth Congress, with a view to determining the advisability of improvements or modifications to existing improvements in the coastal area of Louisiana in the interest of hurricane protection, prevention of salt water intrusion, preservation of fish and wildlife, prevention of erosion, and related water resource purposes."

The House of Representatives Committee on Public Works adopted an identical resolution on 19 October 1967. Sponsors were U.S. Representatives Edwin W. Edwards, Speedy O. Long, John R. Rarick, Joe D. Waggoner, Edwin E. Willis, and the late F. Edward Hebert, Hale Boggs, and Otto E. Passman.

SCOPE OF STUDY

The study area encompasses all of coastal Louisiana between the Pearl River and the Sabine River. The 9.2 million-acre area includes all of the land that would be inundated by hurricane-induced tidal flooding with all existing and authorized hurricane protection works in place, roughly, the 5-foot contour. (See Figure 1.) The coastal area consists of two distinct physiographic elements--the Mississippi River Deltaic Plain and the chenier plain (See Figure 2). The deltaic plain extends from the Chandeleur Islands to Marsh Island and includes the saline deltas of the Mississippi River and the Atchafalaya River. The chenier plain is located west of Marsh Island. The area can be further subdivided into nine sub-basins on the basis of hydrologic characteristics: Chandeleur Sound, Breton Sound, the Mississippi River active delta, Barataria Bay, Terrebonne Bay, Atchafalaya Bay, East and West Cote Blanche Bays and Vermilion Bay, Grand and White Lakes, and Calcasieu Lake. Twenty parishes are completely or partially in the study area: Ascension, Assumption, Calcasieu, Cameron, Jefferson, Jefferson Davis, Iberia, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Mary, St. Tammany, Tangipahoa, Terrebonne, and Vermilion Parishes. All are included in statistical data on population, employment, income, and recreational use. The New Orleans Metropolitan Statistical Area (MSA) is located in the study area, and the Baton Rouge, Houma-Thibodeaux, Lafayette, and Lake Charles MSA's are adjacent to the area.

In support of the overall Louisiana Coastal Area Study effort, a number of broad scope investigations were conducted to provide basic information on the entire coastal area. The investigations are described in the section, "Prior Studies, Reports, and Existing Water Projects." These studies served as an extensive data base for the interim report. The information was used to identify historical trends and existing conditions in the study area environment, to provide insight for projecting future conditions, and to assist in identifying problems.

FIGURE 1

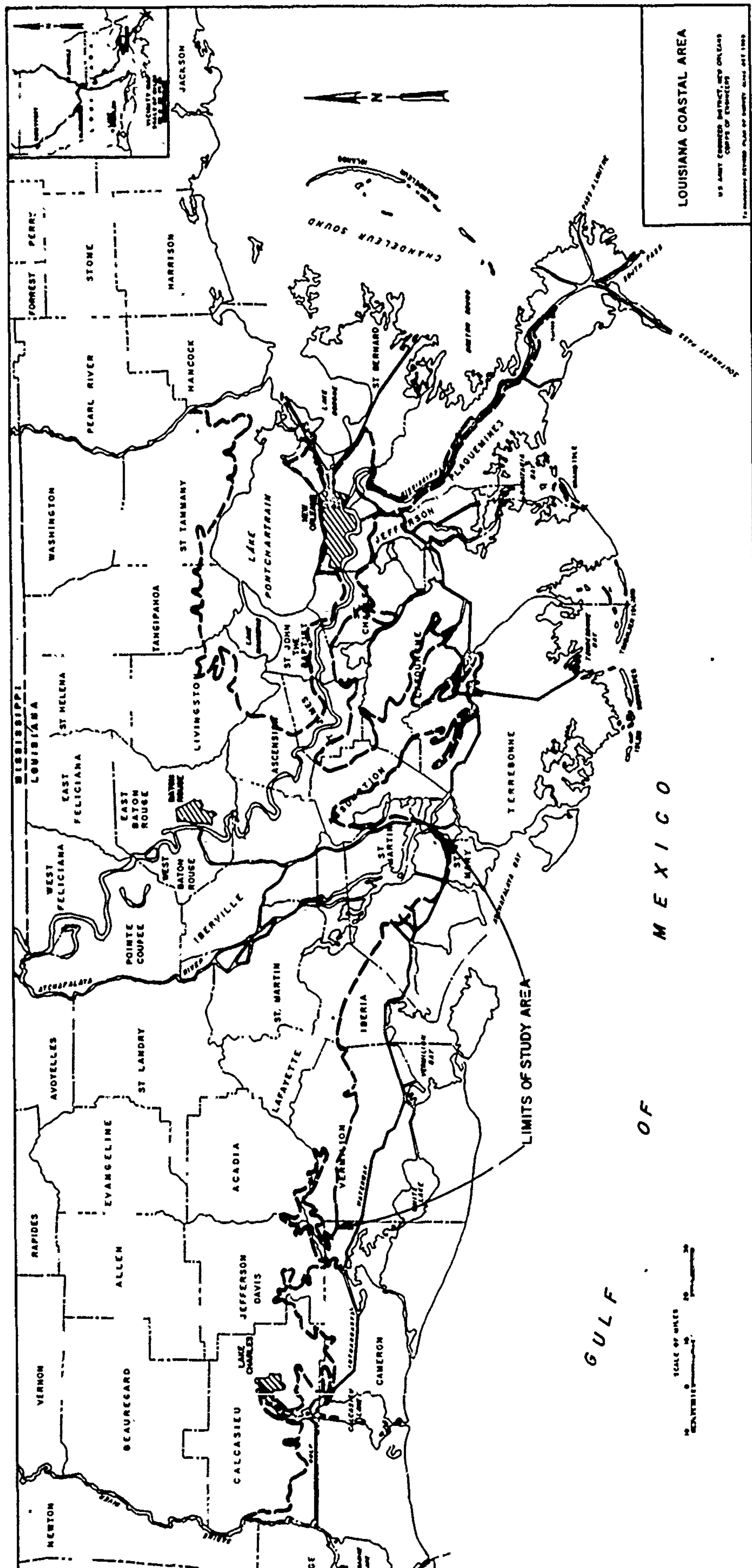


FIGURE 1

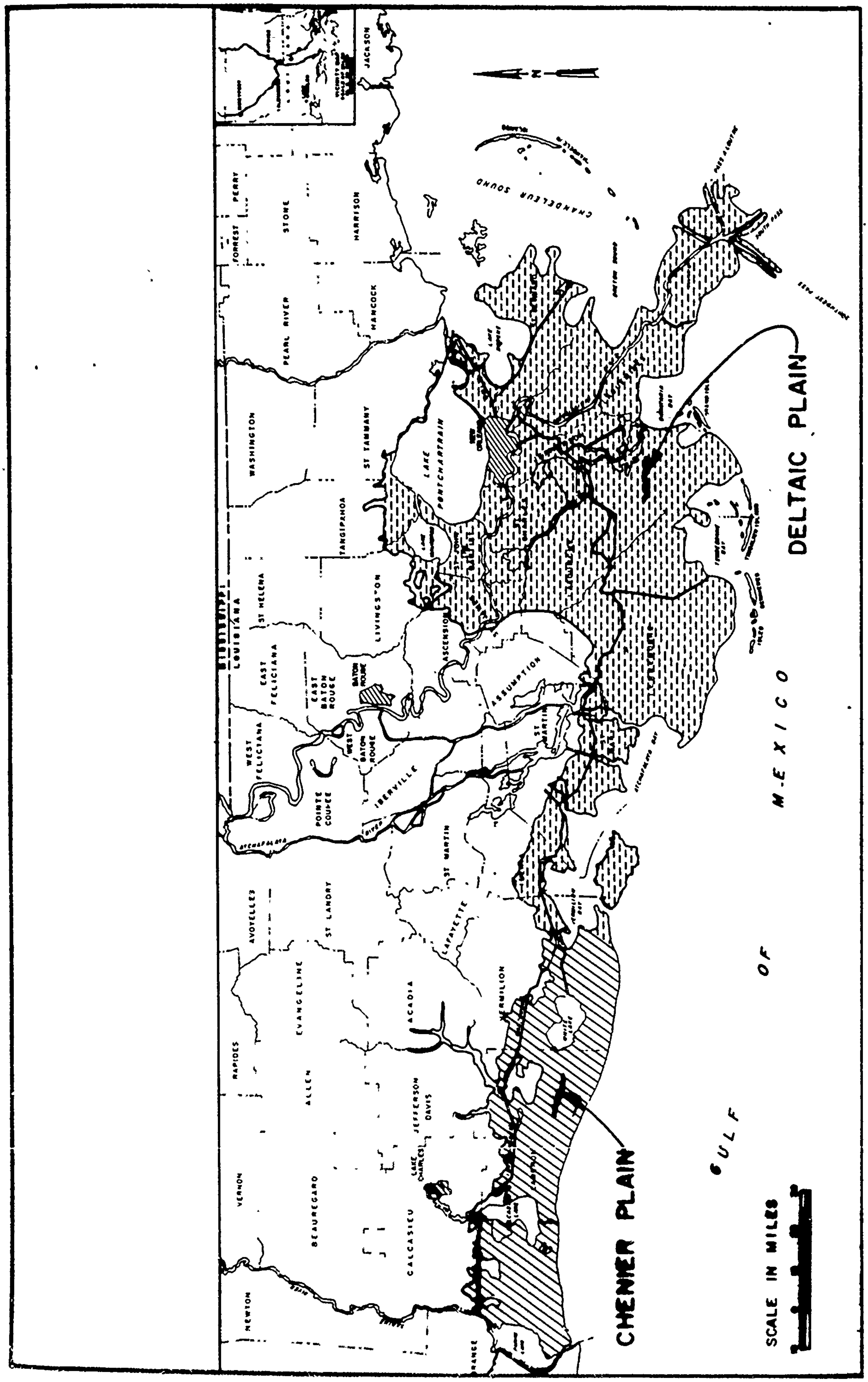


FIGURE 2

FIGURE 2

For this report, available data and information, ground reconnaissance of the area as needed, and office studies were used. The existing and projected 50-year environmental conditions from 1990 to 2040, with and without Federal improvements, were assessed. The problems and opportunities associated with water supply were also assessed. The feasibility of engineering improvements was determined and social, cultural, economic, and environmental impacts were evaluated.

PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

A number of studies and reports concerning water resources development in coastal Louisiana have been prepared by the U.S. Army Corps of Engineers (USACE), other Federal, state, and local agencies, research institutes, and individuals. Several Federal and non-Federal projects that influence water resources have been constructed in the area. A summary of the more relevant studies, reports, and projects are listed in the following paragraphs.

o The Louisiana Wildlife and Fisheries Commission and the Louisiana State University Cooperative Wildlife Research Unit, with support from the USACE, investigated vegetation, water, and soil characteristics and conducted an inventory of wildlife in the coastal area. As a result of this effort, a vegetative type map of the Louisiana marshes and five reports were published.

o The National Marine Fisheries Service (NMFS), under contract to the USACE, analyzed the relationship between commercial fish production and characteristics of the estuarine environment, and established resources and resource development needs as related to estuarine ecology. The studies were completed in May 1972.

o The US Fish and Wildlife Service (USFWS) conducted a statewide survey in 1970 to determine participation in fishing, hunting, and wildlife-oriented activities in the coastal area in the 1968-1969 season. The survey was conducted under contract to the USACE.

o The Louisiana State University Center for Wetland Resources, under contract to USACE, performed studies of the hydrologic and geologic characteristics of coastal Louisiana. The studies examined and identified trends resulting from natural processes and works of man in the coastal area, identified significant environmental parameters, determined freshwater requirements to implement changes for fish and wildlife enhancement, and developed management and structural approaches to solving problems in the estuarine environment. The findings and recommendations of the studies are contained in a series of 18 reports, the last one published in October 1973.

o The USACE, in participation with an interagency group, conducted a fish and wildlife study of the Louisiana coastal area and Atchafalaya Basin Floodway in support of several ongoing studies, including the Louisiana Coastal Area Study. The fish and wildlife study incorporated information from the previous studies and included a preliminary determination of the cyclic quantities of supplemental fresh water needed to optimize productivity of fish and wildlife resources and the possible options for supplying this water to each estuarine area.

o The USACE prepared a draft feasibility report entitled Louisiana Coastal Area, Freshwater Diversion to Barataria and Breton Sound Basins, in April 1983. The report recommends diverting Mississippi River water at Caernarvon in Breton Sound Basin and at Davis Pond in Barataria Basin to enhance habitat conditions and improve fish and wildlife resources. The diversion would reduce land loss and would result in net savings of 99,200 acres of marsh.

Several USACE reports prepared under other authorities are also relevant to this study:

o The USACE prepared a final feasibility report and Environmental Impact Statement, Atchafalaya Basin Floodway System, Louisiana, in 1982. The report recommended a plan to satisfy the flood control needs of southeastern Louisiana and optimize the environmental protection of the lower Atchafalaya Basin Floodway. In June 1982, the Chief of Engineers recommended further studies of the Atchafalaya Bay-Terrebonne marsh complex. These studies will analyze flooding problems east of the floodway and techniques for managing the developing delta in Atchafalaya Bay that are consistent with environmental values. In the investigations, a computer model will be used to determine delta growth. Study results will be included in a final feasibility report, Atchafalaya Basin Land and Water Resources, Louisiana, scheduled for completion in 1987.

o A report entitled Mississippi River, Baton Rouge to the Gulf of Mexico, Louisiana, was published as House Document No. 215, 76th Congress, 1st Session. The report recommended a navigation channel 35 to 40 feet deep by 800 to 1,000 feet wide. Construction of the channel was completed in 1963. The General Design Memorandum Supplement No. 2, dated April 1984, provides for the restoration of deteriorated bank lines below Venice and Southwest Pass with hydraulic fill to reduce shoaling. Shoal material not needed for bank restoration would be used to create a minimum of 9,000 acres of marsh. Supplement No. 2 is currently under review and is scheduled for completion in September 1 984.

o A report entitled Calcasieu River and Pass, Louisiana, was published as House Document No. 436, 86th Congress, 2nd Session. The report and prior River and Harbor Act authorized a 35- by 250-foot channel 36 miles long from the Lake Charles Harbor and Terminal District (including the Clooney Island Loop) to the Gulf of Mexico. The project was authorized

by the River and Harbor Act of 14 July 1960. Work was completed in October 1968.

o A report entitled New Orleans to Venice, Louisiana, Hurricane Protection, was published as House Document No. 550, 87th Congress, 2nd Session. The project provides hurricane protection to developed areas in Plaquemines Parish along the Mississippi River. The locally constructed back levee from City Price to Venice on the west bank would be enlarged and the existing levee from Phoenix to Bohemia on the east bank would be brought up to grade. Work on the features is underway. The General Design Memorandum Supplement No. 5, dated October 1983, provides for the creation of 197 acres of marsh in the Delta-Breton National Wildlife Refuge. The supplement is under review and is scheduled for completion in December 1984.

o A report entitled Louisiana-Texas Intracoastal Waterway, New Orleans, La. to Corpus Christi, Texas was published as House Document No. 230, 76th Congress, 1st Session. The report and prior River and Harbor Acts provide for the construction of a 384.1-mile-long channel 12 deep and 125 feet wide from the mouth of the Rigolets to the Sabine River. The project was authorized for construction by the River and Harbor Act of 23 July 1942. The main stem of the project was completed in 1944.

o A report, Mississippi River-Gulf Outlet, was published as House Document No. 245, 82nd Congress, 1st Session. The report recommends an additional outlet from New Orleans to the Gulf of Mexico with a channel 36 feet deep and 500 feet wide. The improvements were authorized by the River and Harbor Act of 29 March 1956. Construction was initiated in March 1958 and the major channel completed in July 1963.

o A report entitled Barataria Bay, Louisiana, was published as House Document No. 82, 85th Congress, 1st Session. The project provides for a

12- by 125-foot channel approximately 37.0 miles long beginning at the Gulf Intracoastal Waterway (GIWW) and extending to Grand Isle, Louisiana. These improvements were authorized by the River and Harbor Act of 3 July 1958. All work was completed in December 1967.

o A report on the Mississippi River and Tributaries project published as House Document No. 308, 69th Congress, 1st Session, recommended construction of the Mississippi Delta Region project. The project provided for four salinity control structures for introducing fresh water into the delta region. These improvements were authorized by the Flood Control Act of 1965 but have not yet been constructed.

o A report entitled Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana, was completed in July 1981. The report recommended deepening the Mississippi River to a project depth of 55 feet from the Gulf of Mexico to the Ports of New Orleans and Baton Rouge. The report is currently under review. The Board of Engineers for Rivers and Harbors approved the report on March 1982.

o A report entitled New Orleans-Baton Rouge Metropolitan Area, Louisiana, was completed in September 1981. The report contains a comprehensive plan for development and conservation of water and related land resources in the 21-parish area. The report includes 10 parishes in the current study and data was incorporated where appropriate.

o A draft feasibility report entitled Mississippi and Louisiana Estuarine Areas was published in October 1983. The report recommends the diversion of Mississippi River water into Lake Pontchartrain Basin and Mississippi Sound to enhance habitat conditions and improve fish and wildlife resources. The report was completed in February 1984.

Several studies and reports were prepared by other agencies that are relevant to this study:

• The U.S. Fish and Wildlife Service (USFWS) sponsored an ecological characterization study of the Chenier Plain of Louisiana and Texas (Gosselink et al., 1979) and of the Mississippi Deltaic Plain of Louisiana and Mississippi (Bahr et al., 1983 and Constanza et al., 1983). Their studies describe the important biological, physical, and socioeconomic components and processes of the chenier and deltaic plain regions. The reports discuss the causes and effects of land loss and management measures to reduce land loss in the 9.2-million acre area covered by the Louisiana Coastal Resources Program.

• The USFWS and the Louisiana Department of Natural Resources (LDNR) supported habitat mapping studies of the deltaic and chenier plains (Wicker et al., 1980 and 1981). The habitat types were interpreted from aerial photographs for the years 1955-1956 and 1978 and this information was depicted on U. S. Geolological Survey (USGS) quadrangle maps at a scale of 1:24,000. Each habitat type on the 1955-1956 and 1978 habitat maps was measured and compared to determine net changes.

• The USFWS published the Proceedings of the Conference on Coastal Erosion and Wetland Modification in Louisiana: Causes, Consequences, and Options, edited by D. F. Boesch (1982). The proceedings provide a current compendium of information on the natural and man-induced causes of land loss, their impacts on natural resources production and man's use of the area, and possible means of reducing land loss.

• The LDNR published a report entitled Recommendations for Freshwater Diversion to Louisiana Estuaries East of the Mississippi River in June 1982. The report recommends that Mississippi River water be diverted to the Lake Pontchartrain Basin and Breton Sound Basin to improve production of fish and wildlife resources. The report parallels and confirms studies conducted by the USACE under the Louisiana Coastal Area and the Mississippi and Louisiana Estuarine Area Studies.

o The LDNR published a report entitled Louisiana's Eroding Coastline: Recommendations for Protection in June 1982. The report recognizes that future losses of coastal wetlands is unavoidable and will require either retreat of development from the coastal zone or increasingly greater levels of protection. Areas with initial erosion problems were identified and ranked according to severity. The report recommends development and implementation of a shoreline protection plan and proposes a number of pilot projects using water and sediment diversion, dredged material placement, and planting vegetation as a means to reduce erosion. A study to determine future coastal conditions, including changes in shoreline configuration and impacts on developed areas, is also recommended. Information on erosion and shoreline changes was used to define problem areas, to forecast future conditions, and to evaluate alternative plans.

o The Louisiana Department of Transportation and Development (LDOTD) published a report entitled Water Requirements and Availability for Louisiana, 1980-2020. The report was prepared by Urban Systems Associates, Inc., and furnished water supply needs and supplies throughout the state to the year 2020. The report is dated September 1982.

o The LDOTD published a draft report entitled The Louisiana Water Resources Study Commission's Report to the 1984 Legislature. The report, dated April 1984, presents the results of a comprehensive investigation of Louisiana water resources and water policies. The report stresses a need for the development of a comprehensive water policy to increase the health and social usefulness of water to state residents.

o The Boards of Commissioners of Waterworks Districts No. 1, 2, and 3 jointly with the Mayor and City Council of the City of Houma contracted with Gulf South Engineers, Inc., to prepare a report entitled Water Treatment Plant and Trunk Water Mains for Waterworks District

No. 1, Waterworks District No. 2, Waterworks District No. 3, and City of Houma. The draft report was dated July 1983 and contains water use data and design for the districts involved.

- Plaquemines Parish Mosquito Control District prepared a Management Plan for the Breton Sound Estuary in January 1981. The plan proposed diversion of fresh water and sediment to reduce saltwater intrusion, enlarge nursery and harvesting areas, and reduce the rate of land loss.

PROBLEM IDENTIFICATION

NATIONAL OBJECTIVE

The national objective of Federal water resources planning is to contribute to national economic development (NED) in a manner consistent with protecting the nation's environment. Contributions to national economic development are increases in the net value of the national output of goods and services, expressed in monetary units, that occur in the planning area and the rest of the nation. In addition, planning should be in accord with national environmental statutes, applicable executive orders, and other Federal planning requirements.

During the process of the initial evaluation, historical trends and existing conditions are used as a base for forecasting future conditions. In an assessment of the nature and extent of changing conditions, the problems and needs, and the opportunities for improving conditions are identified and the specific planning objectives are defined. Management measures that address the objectives are evaluated and the most feasible measures are incorporated into an array of specific plans. The plans are then assessed and evaluated in terms of their engineering feasibility and their adverse and beneficial effects on the NED objective.

EXISTING CONDITIONS

CLIMATE

The climate of the study area is semitropical and influenced by the Gulf of Mexico. Water temperatures along the Louisiana coast range from 57°F in February to 83°F in August. Southerly winds produce afternoon thundershowers in summer. Winter storms are the frontal type in which showers generally last as long as the storm.

The average annual temperature for the study area in about 68°F; monthly averages range from 51°F in January to 82°F in July. The maximum recorded temperature in the coastal area, 107°F, occurred at Lafayette on July 13, 1901, while a minimum of 3°F was recorded at the Lake Charles airport on February 12, 1899. Monthly average normals from 1951-1980 are:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
51.9°	54.4°	61.0°	68.6°	74.9°	80.3°	82.0°	81.6°	78.3°	69.1°	60.0°	54.3°

The average annual precipitation for the area is 59.7 inches; monthly averages range from 3.1 inches in October to 7.2 inches in July. The maximum monthly rainfall of 37.99 inches occurred at Lafayette in August 1940. Most stations recorded months with no measurable rainfall, the most recent was Kaplan in January 1971. The maximum annual rainfall, 106.64 inches, occurred at the Rice Experiment Station, Crowley, Louisiana, in 1940. A minimum of 27.13 inches was recorded at Lake Arthur, Louisiana, in 1917. The monthly average precipitation in inches from 1951-1980 is:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.7	4.7	4.4	4.7	5.1	4.7	7.2	6.2	5.7	3.1	4.0	5.2

Measurements of evaporation have been collected at the Rice Experiment Station, Crowley, Louisiana, for the period 1910-1949. During this period, the annual evaporation varied from a maximum of 66.5 inches to a minimum of 41.6 inches. Monthly evaporation varied from a maximum of 8 inches in July and August 1947 to a minimum of 1.4 inches in January 1911.

LAND RESOURCES

The Mississippi River has had a profound affect on the landforms of coastal Louisiana. The entire area is the product of sediment deposition following the latest rise in sea level about 5,000 years ago. Sedimentation has caused the coastline to advance gulfward 20 to 50 miles since that time, forming the present day coastal plain. Based on the sedimentary processes responsible for formation of the surface features, the plain is divided into two distinct physiographic areas: the deltaic plain and chenier plain.

The deltaic plain was formed by direct deposition of the Mississippi River as it migrated back and forth across southeast Louisiana. During the past 5,000 years, the river shifted courses and formed seven major delta lobes that are discernible in the area. Figure 3 depicts the major delta lobes and their periods of activity. Each deltaic cycle was initiated by a break or crevasse in the river's natural levee system. Sediment deposition centered in the vicinity of the crevasse but extended gulfward to create a delta lobe. As the lobe expanded, the river's channel enlarged, bifurcated, and reunited to form a network of distributaries bordered by natural levees and interdistributary troughs. In the troughs, extensive swamps and marshes developed. Some distributaries were favored, while others were abandoned. After abandonment, the area underwent compaction, subsidence, erosion, and marine inundation. The marshes became progressively more saline. Water bodies developed and the shoreline

FIGURE 3

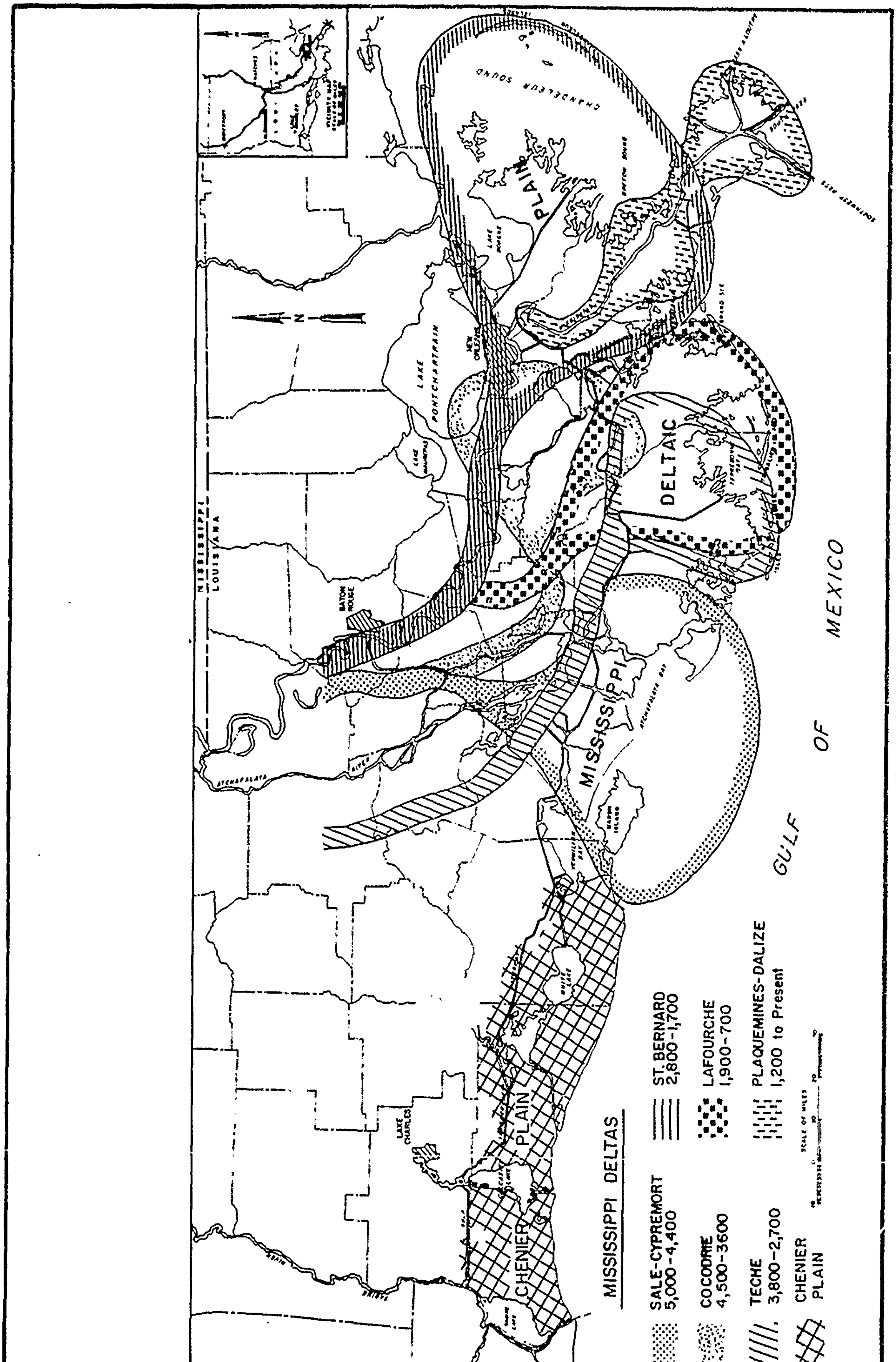


FIGURE 3

retreated rapidly. Gulf waves reworked the sediments along the deltas margins and redeposited them to form the barrier islands.

The chenier plain developed as a result of sediments deposited by the prevailing east to west longshore currents in the gulf. The currents carried westward some of the sediments discharged by the Mississippi River into the gulf and deposited the sediments along the Vermilion and Cameron Parish coasts to form mudflats. The mudflats were colonized by marsh grasses that stabilized the flats and aided in sediment deposition. The mudflats continued to advance gulfward as long as sediments were furnished by the river. When sedimentation ceased, the waves attacked and reworked the marsh deposits. The coarse materials were redeposited as beaches overlying the marshes. The beaches continued to grow until sediments were sufficient to allow mudflat accretion. Mudflat development isolated and surrounded the recently formed beach. The tree-covered, stranded beaches are called cheniers. Some of the cheniers are nearly a mile across and 8 to 10 feet high. The oldest chenier is nearly 10 miles inland from the present shoreline.

WATER RESOURCES

The Mississippi and its distributary, the Atchafalaya, are the largest rivers traversing the coastal area. The total drainage area of the Mississippi River system is 1-1/4 million square miles. East of the Mississippi, the major stream affecting the coastal area is the Pearl River. The Pearl, which drains about 8,670 square miles, empties into Lake Borgne-Mississippi Sound. Other smaller streams in the area are the Tchefuncte and Tangipahoa Rivers that empty into Lake Pontchartrain, and the Amite, Blind, and Tickfaw Rivers that empty into Lake Maurepas. Immediately to the west of the Mississippi, the major stream is Bayou Lafourche, an abandoned distributary. Other important streams are Bayous Barataria, Terrebonne, Blue, DuLarge, and Black. To the west of the Atchafalaya Basin are Bayou Teche and the Vermilion River. The Vermilion

River empties into Vermilion Bay. The major streams in the western area are the Sabine River, which drains 9,760 acres and empties into Sabine Lake, and the Calcasieu River, which drains 3,470 square miles and empties into Calcasieu Lake. The Mermentau River drains a significant portion of the area and empties into Grand Lake, which drains into White Lake, eventually reaching the gulf.

Discharge measurements in the study area are practically nonexistent except for the Mississippi River and several stations above and adjacent to the study area. The tidal influence that makes measurements meaningless is the reason for the absence of discharge measurements along the coast. Table 1 gives the maximum, minimum, and mean discharges where data are available.

Salinities in the estuaries reflect the seasonal changes in tides, rainfall and freshwater runoff, evaporation, and winds. Salinities range between 10 and 30 parts per thousand (ppt) near the coast and decrease gradually inland. The area has experienced a long-term increase in salinity levels, which can be readily detected by shifts in vegetative types. Comparing the 1968 marsh map with one prepared in 1978 reveals that the more saline vegetative types increased by 13.4 percent in the deltaic plain marshes and 14.7 percent in the chenier plain marshes.

Fresh groundwater is found in coastal Louisiana aquifers that range in age from Miocene to Holocene. The Quaternary aquifer system blankets the southern half of the state as well as most of the main river valleys in the northern part of Louisiana. The system includes the Pleistosene terrace deposits, the Holocene alluvial deposits, and the Mississippi River alluvial deposits. These deposits are considered as a single hydrologic unit although some segments may act as a separate aquifer, especially in southeast Louisiana where the system has a number of regional names depending on the area of development. In southwest Louisiana, the terrace

TABLE 1

MAXIMUM, MINIMUM AND MEAN DISCHARGE AT AVAILABLE LOCATIONS

Station	Period of Record	Mean Discharge (CFS)	Extremes (CFS) Maximum	Extremes (CFS) Minimum
Mississippi River @ Tarbert Landing	1938-80	467,900	1,980,000	85,000
Atchafalaya @ Simmesport	1938-80	194,300	781,000	10,500
Lower Atchafalaya River @ Morgan City	1905-82	741,000	-	-
Bearhead Creek near Starks (Calcasieu River Basin)	1954-82	229	11,200	0
Bayou Teche @ Keystone Lock (Teche-Vermilion Basin)	1959-81	505	3,970	0
Ruth Canal @ Ruth (Teche-Vermilion Basin)	1959-81	162	802	2.6 1/
Pontchartrain Basin				
Amite River near Denham Springs	1938-82	1,966	110,000	271
Tickfaw River at Holden	1940-82	366	19,000	65
Natalbany River at Baptist	1943-82	114	9,550	2
Amite River near Darlington	1949-82	893	76,400	188
Tchefuncta River near Folsom	1943-82	159	29,200	26
Tangipahoa River near Robert	1938-82	1,129	50,500	245
Bayou LaFourche @ Donaldsonville	1957-82	244	642	0
Pearl River near Bogalusa	1938-81	9,671	129,000	1,020

1/ Affected by backwater.

deposits and the alluvium of the streams are referred to as the Chicot aquifer and as such are considered to be a separate entity.

There are four major fresh water-bearing units within the southeastern area along the Mississippi River. They are, in descending order, the shallow aquifer, the Gramercy aquifer, the Norco aquifer, and the Gonzales-New Orleans aquifer. In the area south of New Orleans, there is no fresh groundwater, but large quantities of slightly saline water are available for purposes such as industrial cooling. Industry is the major user of groundwater in this area. The supply for future demands seems to be adequate if slightly saline water can be used.

In Iberia, St. Mary, Terrebonne, and Lafourche Parishes, large supplies of groundwater are available in the Atchafalaya River and its alluvial aquifer. The Atchafalaya River is hydraulically connected with the aquifer in this area. The effect of projected withdrawals on the aquifer, therefore, will be insignificant since water levels will fluctuate with the stages of the Atchafalaya River. However, as groundwater usage increases, water will, in effect, be diverted from the Atchafalaya River into the aquifer. The southern portion of St. Mary Parish and Lafourche and Terrebonne Parishes have no available fresh groundwater.

Groundwater resources of the parishes north of Lake Pontchartrain, sometimes called the Florida Parishes, constitute one of the largest sources of fresh groundwater in Louisiana. There are 12 major aquifers in the area ranging in age from Miocene to Holocene; consequently, large supplies of fresh groundwater are readily available. Maximum depth for these freshwater supplies is approximately 3,500 feet. However, sand units containing saline water occur above many of the freshwater-bearing sands.

The Chicot aquifer is the principal source of groundwater in southwestern Louisiana or the chenier plain area. The aquifer consists of a series of

Pleistocene terrace deposits composed chiefly of sand and gravel overlain by Holocene clay, silt, and interbedded sand, all of which form a single hydraulic unit. The "200-foot," "500-foot," and "700-foot" sands are the three principal sands units of the Chicot aquifer in southwestern Louisiana.

The principal source of groundwater recharge to the Chicot aquifer is by precipitation at the outcrop area located immediately northwest of the rice farming belt. In some areas, the Chicot is covered by a thin veneer of silt and clay of relatively low permeability. Where the aquifer is covered by such deposits, recharge occurs principally along stream channels that cut through this material. Water levels in the Chicot have shown a moderate decline in the past. This trend has been reversed because there is less production and less use of water. Industrial use of Sabine River water has increased as result of the recent opening of the Sabine River Diversion Canal system.

WATER QUALITY

For water quality discussion purposes, the study area was subdivided into nine river/drainage basins. Each is discussed separately. Each basin has a water quality designation assigned by the State of Louisiana and problems such as low dissolved oxygen (DO), high coliform, high nutrients and pesticides, high metal content, and high chloride levels are discussed.

Pearl River Basin. The entire Pearl River Basin has been designated by the State of Louisiana as effluent limited. This designation indicates that water quality is meeting and will continue to meet applicable water quality standards or that there is adequate demonstration that water quality will meet applicable effluent limitations required by the Clean Water Act, as amended. No serious water quality problems are known to exist in the Pearl River Basin. In the coastal area, a problem does exist near Slidell where the coliform standard has been consistently violated due to sanitary discharges. DO violations have been infrequent and not severe in the coastal area.

High salinity and total dissolved solid (TDS) levels due to saltwater intrusion can be present in the lower parts of the Pearl River Basin, especially in the East Pearl River. The extent and magnitude of salinity levels do not significantly impair beneficial uses. Maximum, minimum, and mean saline concentrations for each basin are given on Table 2.

Lake Pontchartrain Basin. The Lake Pontchartrain Basin was divided into 16 subdrainage basins for water quality planning purposes. A number of sub-basins have designated uses for primary and secondary contact recreation and propagation of fish and wildlife. No surface waters in the Lake Pontchartrain Basin have been classified as sources of domestic raw water supply. Many estuarine locations in the southeastern portion of the basin are designated shellfish-harvesting waters.

On a basin-wide basis, water quality within the Lake Pontchartrain Basin is considered as meeting the goals of the Clean Water Act only marginally. Specific problem areas have been noted throughout the basin and four study area stream segments, all located near metro New Orleans, are presently classified as "water quality limited." The water quality limited classification is applied to stream segments where water quality does not presently meet applicable water quality standards or is not expected to meet applicable standards even after application of the technology- based effluent limitations required by the act. The four water quality limited stream segments are: Lake Pontchartrain and minor tributaries, Bayous Castine, Chinchuba, and Cane, the Inner Harbor Navigation Canal, the GIWW from the IHNC to Chef Menteur Pass, and the Mississippi River-Gulf Outlet (MR-GO) and tributaries, Bayous Bienvenue and Dupre.

Violations of DO, fecal coliform, and pH standards are principal Problems in the basin north of Lake Pontchartrain. Recurrent violations of fecal coliform standards and periodic contraventions of standards for DO, chlorides, and sulfates are primary problems in the water quality

TABLE 2

CHLORIDE CONCENTRATION Mg/L

Basin and Station	Mean	Max	Min	No. of Records	Period of Record
PEARL RIVER BASIN					
Pearl River (East) at Hwy. 90 Bridge	1,033	7,075	2	61	78/03/07 to 83/08/09
LAKE PONTCHARTRAIN BASIN					
Lake Pontchartrain at North Shore	2,216	9,100	60	6,318	57/07/02 to 81/09/30
MISSISSIPPI RIVER BASIN					
The Jump at Venice	233	7,500	7	1,413	70/08/18 to 81/06/09
BARATARIA BASIN					
Bayou Lafourche at Leeville	8,315	17,000	130	15,484	55/10/26 to 77/01/12
TERREBONNE BASIN					
Houma Navigation Canal near Crozier	303	11,000	2	5,883	61/09/19 to 81/12/04
ATCHAFALAYA BASIN					
Lower Atchafalaya River at Morgan City	41	1,450	6	14,404	46/08/13 to 81/11/06
MERMENTAU-VERMILION-TECHE BASIN					
Mermentau River (south) at Catfish Pt.	1,214	14,750	0	5,268	51/07/09 to 81/12/31
Control Structure (north)	812	14,750	2	12,151	49/06/21 to 81/12/26
CALCASIEU RIVER BASIN					
Calcasieu River and Pass at Lake Charles	3,838	19,750	5	31,321	52/02/05 to 81/03/30
SABINE RIVER BASIN					
Sabine River at I-10 Bridge	740	6,195	7	113	66/01/01 to 78/02/10

limited stream segments. High turbidity, suspended solids, and nitrogen and phosphorus levels have also been problems in some areas. Municipal and industrial point source discharges are major contributors to water quality degradation in the basin. Additionally, nonpoint sources are thought to have a significant impact on water quality.

Lower Mississippi River Basin. The State of Louisiana has designated the Mississippi River segment within the study area as suitable for secondary contact recreation, propagation of fish and wildlife, and domestic raw water supply. Phenol exceeds the drinking water standard about 30 percent of the time and has caused taste and odor problems in treated water supplies. Ship/barge traffic and many industrial outfalls are potential sources of wastewater high in phenol. The extensive petrochemical complex along this segment discharges trace metals and numerous organic compounds. Although total loading rates of various chemicals are great, the river's vast dilution capacity prevents dangerously high concentrations from occurring under normal conditions. Several large municipal wastewater discharges on the New Orleans reach account for most of the coliform loads. If the ship discharges were released near municipal intakes, water supplies could be affected.

Pesticides, particularly DDT, have been an occasional problem. Organics tend to react with the chlorine used for disinfection of drinking water to form trihalomethane compounds that are hazardous to human health. Industrial wastes contain many substances known or suspected to be carcinogenic, so continued monitoring is important for protection of water supplies in this and downstream segments. The river's high suspended sediment loads tend to attract and hold the major portion of most toxic substances, resulting in their eventual deposition in the river bottom or in the Gulf of Mexico.

Barataria Basin. The entire Barataria Basin has been designated as effluent limited. However, there are many water quality problems such as low DO levels, excessive nutrient levels, bacterial contamination of shellfish waters, and saltwater intrusion. The upper part of the basin has experienced DO problems. DO levels have consistently been below the criterion and concentrations near zero mg/L are not unusual. Significant levels of nutrients have also been present in the upper part of the basin, creating potential eutrophication problems.

Water quality in Lake Salvador is good with adequate DO levels and low biological oxygen demand (BOD) and nutrient concentrations. Bayou Segnette is a problem area with low DO levels and elevated BOD levels, nutrients, and fecal coliform. The GIWW, Harvey Canal, and Algiers Cutoff have had problems with low DO and nutrients. Mississippi River water diverted through the Algiers and Harvey Locks improves the water quality in these canals. DO, BOD, and nutrient levels are acceptable in the Little Lake-Barataria Bay area. However, the most important water quality parameter is total coliforms because of the oyster beds located there. The highest concentrations are in Little Lake and along Bayou Barataria. Most of the time, the water quality in Barataria Bay and the lower bays is acceptable for oyster production. Mercury and some pesticide concentrations have exceeded standards on occasion. Saltwater intrusion is a concern throughout the basin, especially in the oyster harvesting areas.

Terrebonne Basin. Most of the basin has been designated as suitable for primary and secondary contact recreation, fish and wildlife propagation, and domestic raw water supply. Another large area is designated for each use category except domestic raw water supply. The remainder of the area is designated as suitable for secondary contact recreation and fish and wildlife propagation only.

High coliform counts and low DO have been observed near Houma and other population centers. Wastewater from Houma and Morgan City are primarily responsible for the frequent coliform violations and DO defects. Saltwater intrusion has also occurred throughout the area. The Houma Navigation Canal is the chief route of the intruding saltwater into interior areas.

Erosion of sediments from agricultural lands and urban areas, particularly Houma, greatly increases suspended solids levels in water bodies after storm events. These sediments are often carriers of nutrients from fertilizers, pesticide residues, and other accumulated substances that may cause pollution problems.

Atchafalaya River Basin. The Atchafalaya River below Bayou Boeuf has been designated as suitable for primary and secondary contact recreation and propagation of fish and wildlife. The GIWW between Bayou Boeuf Lock, Wax Lake Outlet, and Atchafalaya Bay are designated for secondary contact recreation and fish and wildlife propagation only.

The runoff in the area within the Atchafalaya Floodway levees carries large quantities of nutrients (phosphorus and nitrogen) and fixed energy (dissolved organic carbon) via the Atchafalaya River and Wax Lake Outlet to estuaries and marine waters, maintaining their high productivity levels. Water leaving the floodway is generally low in heavy metals and pesticides, though the Morgan City industrial area produces toxic wastes.

The reach of the Atchafalaya River below Bayou Boeuf, the GIWW reach, and Wax Lake Outlet have been monitored on a limited basis between 1973 and 1975. The water quality measurements taken at that time did not reveal any particular water quality problems in the Atchafalaya Basin area.

Mermentau-Vermilion-Teche Basin. The Vermilion River from the Interstate 10 bridge to the GIWW has been designated as water quality limited. All other waters in the coastal portion of the basin have been designated as effluent limited.

The major area of concern in the basin is the Vermilion River and tributaries downstream from Interstate 10 to the GIWW. The most serious problems here are low DO levels, high concentrations of fecal coliform bacteria, and high BOD loadings. These are caused mainly by municipal wastewater discharges from the cities of Lafayette and Abbeville. Excessive concentrations of pesticides are probably present in the Vermilion River as a result of agricultural runoff.

In the Grand and White Lakes area, elevated levels of PCB, mercury, and pesticides have been experienced. High nutrient levels have been noted periodically in Bayou Lacassine and in the GIWW near Lake Arthur.

Saltwater intrusion into the Vermilion River and the resulting high TDS, chloride, and sulfate levels have been a source of concern in the past. The salinity levels in the river have been known to rise during conditions of low fresh water flow and high tides in the Gulf of Mexico. These conditions cause saltwater from the gulf to move into the normally freshwater regions of the river. The Teche-Vermilion diversion project is helping to alleviate this problem. Elevated levels of chlorides and sulfates have been observed in Grand and White Lakes due to saltwater intrusion. A system of control structures consisting of Calcasieu Lock, Catfish Point Control Structure, Freshwater Bayou Lock, Schooner Bayou Control Structure, and Vermilion Lock was constructed to control this saltwater intrusion in the Grand and White Lakes area. Except for this area, which is somewhat protected by the control structures and the chenier plains, the coastal area within the basin is subject to saltwater intrusion, especially during low flow periods.

Calcasieu River Basin. The lower, tidally influenced portions of the Calcasieu River mainstem from the saltwater barrier to the Gulf of Mexico, including Lake Charles, Prien Lake, Calcasieu Lake, Calcasieu Pass, and the east and west fork, have been designated by the State of Louisiana as water quality limited.

The major area of concern is DO in the Calcasieu River. Coliforms and BOD concentrations also sometimes cause problems downstream from Lake Charles due to municipal wastes. Discharges from the Lake Charles industrial area add pollutants related to industrial activity such as metals and organics into the Calcasieu River.

The lower Calcasieu River estuarine area is affected by natural swamp-water loads and agricultural sources. Some indication of agriculture-related pesticide problems has been noted.

High salinity and TDS levels can be present in the lower parts of the basin. The Calcasieu River is tidally influenced up to the saltwater barrier above Lake Charles. The barrier divides the river into the riverine freshwater portion above the structure and a saltwater estuary below.

Sabine River Basin. The coastal portion of this basin has been designated as effluent limited. Areas of concern are DO and total coliform criteria violations in Sabine Pass and occasional violations of DO criteria in the Sabine River. DO is also a problem in the upper portions of the coastal areas, though to a lesser degree.

Nutrient and pesticide loadings are low because of the small total cropland acreage. Metal loadings are also low because there is very little industry in the basin.

High salinity and TDS levels can be present in the lower parts of the basin. Morgan's Bluff is generally the dividing line between the saltwater and fresh water, leaving the entire coastal area subject to saltwater intrusion. The extent and magnitude of salinity levels do not significantly impair beneficial uses and will not for the near future.

BIOLOGICAL RESOURCES

The dominant terrestrial habitats in the coastal area include bottomland hardwoods, wooded swamps, and marshes. Many fresh to saline water bodies of various sizes and depths, including ponds, streams, lakes, and bays, are interspersed throughout the area. Bottomland hardwood forests occupy about 72,000 acres of habitat, and wooded swamps cover about 359,000 acres. Marshes cover approximately 2.53 million acres.

Bottomland hardwoods are typically located along distributary ridges that extend into the marshes. Common species in this habitat include various types of oak, ash, pecan, and maple. Wooded swamps are generally located inland from fresh marsh areas. Wooded swamp vegetation includes baldcypress, tupelogum, red maple, duckweeds, alligatorweed, water hyacinth, and swamp lilies. The marshes are categorized into four distinct types based on salinity and dominant plant species. These types include fresh, intermediate, brackish, and saline. Salinity varies from a mean of 1.5 ppt in the fresh marsh to a mean of 15.9 ppt in the saline marsh.

Typical fresh vegetation includes bulltongue, maidencane, sawgrass, panic grass, cattail, water hyacinth, and alligatorweed. Intermediate marsh vegetation includes wiregrass, cypress, deerpea, bulltongue, sawgrass, wild millet, bullwhip, and three-cornered grass. Typical brackish marsh vegetation includes wiregrass, three-cornered grass, leafy threesquare, saltgrass, oystergrass, and widgeongrass. The most abundant plant species in the saline zone are oystergrass, black rush, saltgrass, glasswort, and saltwort.

The fresh and intermediate marshes have similar values in terms of wildlife productivity. Therefore, these two marsh types have been combined in this study and are referred to as the fresh/intermediate marsh. Of the total acres of marsh, 1,184,000 acres are fresh/intermediate, 912,000 acres are brackish, and 434,000 acres are saline marsh.

The diversity and areal extent of the forested wetlands and coastal marshes provide excellent habitat for a variety of wildlife including mammals, birds, reptiles, and amphibians. These wildlife resources provide many commercial and recreational opportunities. The largest fur harvest in the United States comes from Louisiana's wetlands. The state has been the leading fur-producing area in North America as long as records have been kept (Lowery, 1974). Large numbers of migrating waterfowl are present in the area. The coastal marshes winter more than two-thirds of the entire Mississippi Flyway waterfowl population (Bellrose, 1976). These waterfowl are very popular with sportsmen. According to the Louisiana Department of Wildlife and Fisheries, over $25 million is spent on waterfowl hunting each year.

Diverse and highly productive finfish and shellfish resources are found in the numerous fresh to saline water bodies in coastal Louisiana. These resources are both commercially and recreationally exploited. The bulk of the fisheries are estuarine-marine in nature. Most of the important species are estuarine-dependent. They spawn offshore in water of stable salinity and temperature. The eggs hatch in a short time and the organisms pass through various larval stages. The small organisms then migrate with the aid of tides and currents into the fertile, low salinity estuarine areas. The juvenile organisms grow very rapidly in the marshes during the warm spring and summer months, then generally begin to move back offshore with the onset of cooler weather. For these species, the marshes are crucial to the successful completion of their life cycle. The value of Louisiana's estuarine-marine fisheries is substantial. The state's total landings are annually the highest in the nation. In 1981, the landings

weighed in at over 1.2 billion pounds with an exvessel price of about $221 million, making Louisiana fisheries first in tonnage and fourth in value among the 50 states (Aquanotes, 1983). The fisheries include menhaden, shrimp, oysters, crabs, and other species.

Sport fishing in the study area is diverse and substantial and includes both fresh- and saltwater fishing. Saltwater sport fishing includes shrimping, crabbing, and finfishing. Both brown shrimp and white shrimp are taken by sport trawlers while blue crab is the only crab species taken in significant numbers by sport fishermen. Saltwater sport finfishes commonly harvested include spotted seatrout, sand seatrout, Atlantic croaker, spot, red drum, black drum, sheepshead, southern flounder, southern kingfish, and Spanish mackerel. Freshwater sport fishing occurs in the fresh to slightly brackish waters in the upper portion of the area. Species commonly taken include largemouth bass, black crappie, white crappie, warmouth, bluegill, redear sunfish, channel catfish, blue catfish, and flathead catfish. Red swamp crawfish are also taken in the wooded swamps and fresh marshes. Recreational fishing in Louisiana contributes an estimated $150 million annually to the state economy (Aquanotes, 1980).

A number of endangered and threatened species, including reptiles, birds, and mammals, are actually or potentially present in the area. The alligator is classified as "threatened" under the Similarity of Appearance clause of the Endangered Species Act of 1973. Under this classification, controlled harvest of this species is permitted. Endangered sea turtles present in the area include the Kemp's Ridley, hawksbill, and leatherback. Loggerhead and green sea turtles are also found in the study area and are considered threatened. Endangered birds known to include the bald eagle, brown pelican, arctic peregrine falcon, and red-cockaded woodpecker. Endangered birds that could possibly occur in the area include Backman's warbler, Eskimo curlew, greater prairie chicken, whooping crane, and ivory-

billed woodpecker. The Florida panther may occur in the area and possibly the red wolf. Endangered marine mammals that may venture into the nearshore waters of the area include blue, finback, humpback, sei, and sperm whales.

CULTURAL RESOURCES

The coastal area is rich in both prehistoric and historic cultural resources. The deltaic plain contains the highest density of archeological remains in the state. Almost all abandoned natural levees in the deltaic plain contain prehistoric or historic archeological sites. Due to favorable environmental conditions, many prehistoric sites were repeatedly reoccupied over long periods of time. Continuous occupation combined with high subsidence rates has produced an "iceberg" effect. Only 1 or 2 feet of a site will be exposed while another 6 to 18 feet remains buried below the ground surface as a result of subsidence. There is a high potential for archeological sites in this region as a result of burial and unique conditions that favor the preservation of wood, plant remains, fabrics, basketry, and other normally perishable remains. To date, over 800 sites have been recorded in this area. Since systematic archeological surveys are incomplete and many sites are buried below the marsh surface, the actual number of sites is much greater. Sites range in cultural associations from 1,000 years B.C. to the historic period, but the majority date from the Coles Creek Period. The Louisiana Division of Archaeology lists 13 sites on the National Register. Twelve additional sites have been determined to be eligible for the register.

The chenier plain has a unique cultural history that combines Texas coastal elements with cultures of the Mississippi Valley. Sites ranging from Paleo-Indian (ca. 10,000 B.C.) to the historic have been identified. Sites are found on the cheniers, natural levee crests, salt domes, and terrace margins. Over 400 sites have been recorded with the majority from the Coles Creek Period. To date, no archeological sites are listed on the National Register, but four sites have been determined eligible.

RECREATION RESOURCES

The area resources offer a vast array of recreational opportunities and the water areas are the greatest attraction. Major recreational activities are fishing, hunting, boating, swimming, crabbing, shrimping, and camping. One in every two persons in the study area is involved in outdoor recreation.

Recreation inventory data for this study was compiled from information obtained from the Louisiana Department of Culture, Recreation and Tourism, Division of Outdoor Recreation, Office of State Parks, and field investigation. A summary of the major outdoor recreation facilities for the study area shows that there are 368 boat launching ramps, 1,878 picnic tables, 1,845 recreational vehicle camping spaces, and 621 tent camping spaces.

Recreational fishing is by far the most heavily pursued activity in the study area. In the recreation market area, (20 Louisiana parishes) 234,200 resident sport fishing licenses were issued in the 1982-1983 season[1/]. Most of the fishing that occurs is accomplished by boat. The boat use is reflected in the 145,468 motorboat registrations issued in 1983 for the market area, 48 percent of the state total, and by the results of the 1980 Louisiana Statewide Comprehensive Outdoor Recreation Plan Demand Survey that indicated that boat fishing is the second most preferred activity of recreationists statewide.

1/ This licensing data does not reflect the fact that fishing licenses are not required for residents fishing in Louisiana using a rod, pole, or hook and line without a reel or artificial bait.

Hunting activities are as varied as fishing activities. Hunting for small game is the most prevalent activity and a wide range of species and associated habitat types are available. Big game hunting for whitetail deer is confined to the bottomland hardwoods. Waterfowl hunting is the most well-known hunting activity in the study area although the demand is lower than other hunting activities. For the 1982-1983 hunting season, 205,900 resident hunting licenses were issued in the 20-parish market area. This figure includes 55,493 licenses issued for big game species.

Because of the vast unpopulated areas in the coastal zone, the construction of recreational camps has become popular. Current inventories reflect the approximately 10,220 camps that presently exist across the Louisiana coast. The camps are built in many different styles and designs and vary from simple one-room unit construction to elaborate two-story units with such amenities as swimming pools, glass enclosed verandas, and accommodations for as many as 50 individuals at one time. More than 40 percent of the residential dwellings are only accessible by water. A 1976 survey of 88 camps along Bayou de Cade in Terrebonne Parish showed that these camps each averaged 340 man-days of recreation annually.

Overall, the primary users of the recreation resources in the study area are residents of southern Louisiana, southern Mississippi, and eastern Texas. The 1980 survey conducted by the Louisiana Department of Culture, Recreation and Tourism, Division of Outdoor Recreation, Office of Program Development, indicates that 81.7 percent of boat fishing activity occasions and 86.6 percent of the small game hunting activity occasions occur within 45 miles of the participant's residence.

ECONOMY

The study area is rich in commercially important minerals and generously endowed with a variety of fish and wildlife resources. As a result, the economy is founded on a base of natural resources. With an extensive system of navigable waterways and a strategic location, the area is a hub for foreign and domestic trade and harbors a cultural and historical heritage that ranks with the most significant in the nation.

In 1975, which was the last year energy-related mineral production was published by parish, the total mineral production was $7.4 billion excluding data withheld to avoid disclosure, which was 12 percent of the mineral production in the United States. While production of lime, sulfur, salt, sand and gravel, cement, stone (shell), and clays have been important, the vast majority of the production value has been from the extraction of crude petroleum, natural gas, and natural gas liquids. The production of crude petroleum in Louisiana in 1971 was 935,243,000 barrels. About 95 percent of the state's total extraction was from gulf areas, including 474,521,000 barrels from onshore areas and 415,305,000 barrels from offshore areas. While crude petroleum production has experienced a period of rather sharp decline, natural gas production in Louisiana has remained relatively constant.

In recent years, the growth of port and harbor activities, commerce, tourism, and mineral production has tended to overshadow the historic cultural and economic significance of commercial fishing industries. Nevertheless, preliminary NMFS reports indicate that in 1982 Louisiana ranked first in the nation in total volume of fish and shellfish landings with 1.7 billion pounds. The state ranked third, behind Alaska and California, in value of landings with $239.9 million. Menhaden, a species of fish used for industrial purposes, accounted for the largest volume landed in Louisiana, followed by shrimp, crabs, oysters and catfish.

The most important crops produced in the study area are rice, soybeans, and sugarcane. Cattle and calves have been the most important livestock products sold. The latest Census of Agriculture (1978) estimated the market value of all agricultural products sold in the study area at $321 million, about 26 percent of the Louisiana total. The 1969 census estimated the value of all agricultural products sold at $163 million or 33 percent of the state total. Nationwide, the price of farm products increased by about 96 percent from 1969 to 1978. Although declining as a percent of the state total, the real value of farm products in the study area does not appear to have declined significantly.

HUMAN RESOURCES

Population of the study area in 1980 was 2,077,934, an increase from the 1970 figure of 1,793,290 or 16 percent. The annual growth rate of 1.5 percent during this period exceeded both the national growth rate of 1.0 percent and the state rate of 1.4 percent. The study area population grew faster than the total population of Louisiana and the United States. With the exception of Orleans Parish, all parishes gained in population during this 10-year period. In the study area, population is concentrated in the New Orleans MSA, which includes Jefferson, Orleans, St. Bernard, St. Charles, St. John the Baptist, and St. Tammany Parishes. These parishes contain 1,256,668 people, about 60 percent of the population of the study area. Other areas of population concentration include the Houma-Thibodeaux MSA, the Lake Charles MSA, Tangipahoa Parish, St. Mary Parish, Iberia Parish, Livingston Parish, and Ascension Parish.

The 1981 per capita personal income averaged $5,311 for the study area compared with the state and national averages of $4,913 and $5,419, respectively (all in 1972 constant dollars). The 1980 census reports unemployment in the study area at 7.9 percent, somewhat higher than the 6.0 percent estimate for the state. The Louisiana Department of Labor "Labor

Market Information" report for September of 1983 estimated unemployment in the vicinity of the study area at 11.4 percent, slightly less than the 11.6 percent figure for the state.

TRANSPORTATION

The study area is served by a varied and extensive transportation system. Deep-draft navigation access is provided to the Ports of New Orleans and Baton Rouge by the Mississippi River and the MR-GO, to the Port of Morgan City by the Atchafalaya River and Bayous Chene, Boeuf, and Black, and to the Port of Lake Charles by the Calcasieu River and Pass. Shallow-draft access is provided by many inland waterways including the GIWW, Barataria Bay Waterway, Bayou Lafourche, Houma Navigation Canal, Vermilion River, and the Mermentau River.

The Port of New Orleans is the world's largest grain port, the largest seaport in the United States, and the second largest in the world in terms of dollar value and waterborne tonnage handled. The port handled 188.8 million tons of commerce in 1981. This commerce consisted of 80.2 million tons of foreign trade, 14.4 million tons of coastwise traffic and 94.2 million tons of internal traffic. The Port of Lake Charles handled 20.7 million tons, consisting of 7.6 million tons foreign traffic, 2.8 million tons coastwise traffic, and 10.3 million tons of internal traffic. Although the Port of Baton Rouge is out of the study area, deep-draft traffic must move through the area to reach this location. Foreign traffic at this port in 1981 amounted to 25.7 million tons.

Other ports in the study area include the Ports of Houma and Morgan City. Both ports are considerably smaller than the other ports previously mentioned, but they make a sizable contribution to their local economy.

Other vital forms of transportation that serve the area include mainland railroads, Federal interstate highways, Federal and state highways, and an extensive network of oil and gas pipelines. The Southern Pacific Railroad runs east and west through much of the study area. Spur lines extend along the alluvial ridges as far south as the GIWW and along the Mississippi River below New Orleans.

FUTURE CONDITIONS WITHOUT FEDERAL PROJECT

The most probable future conditions if no Federal action is taken were determined by projecting conditions expected to prevail in the study area over the planning period 1990 to 2040 with all authorized Federal projects in place.

WATER AND LAND RESOURCES

Based on the land loss trend from 1890, the entire coastal area will experience drastic losses by the year 2040. Studies by Gagliano and Von Beek (1970) revealed an annual land loss rate of about 16.5 square miles per year (mi2/yr) for the entire Louisiana coast. Later investigations from 1955 to 1978 showed more serious losses. In the more recent studies, the losses were computed for the deltaic plain and chenier plain. The annual land loss in the deltaic plain was 29 mi2/yr. The estimated land lost in the chenier plain was 10.6 mi2/yr. Specific areas within each plain experienced much greater loss.

The 2040 conditions were obtained by an extrapolation of experienced losses considering all direct or indirect influences including eustatic sea level rise, subsidence, erosion, and man-induced activities. By 2040, 555,200 acres of land will be converted to water in the deltaic plain. In the chenier plain, 231,900 acres will be lost by 2040. (See Figure 4 depicting the 2040 coastline.)

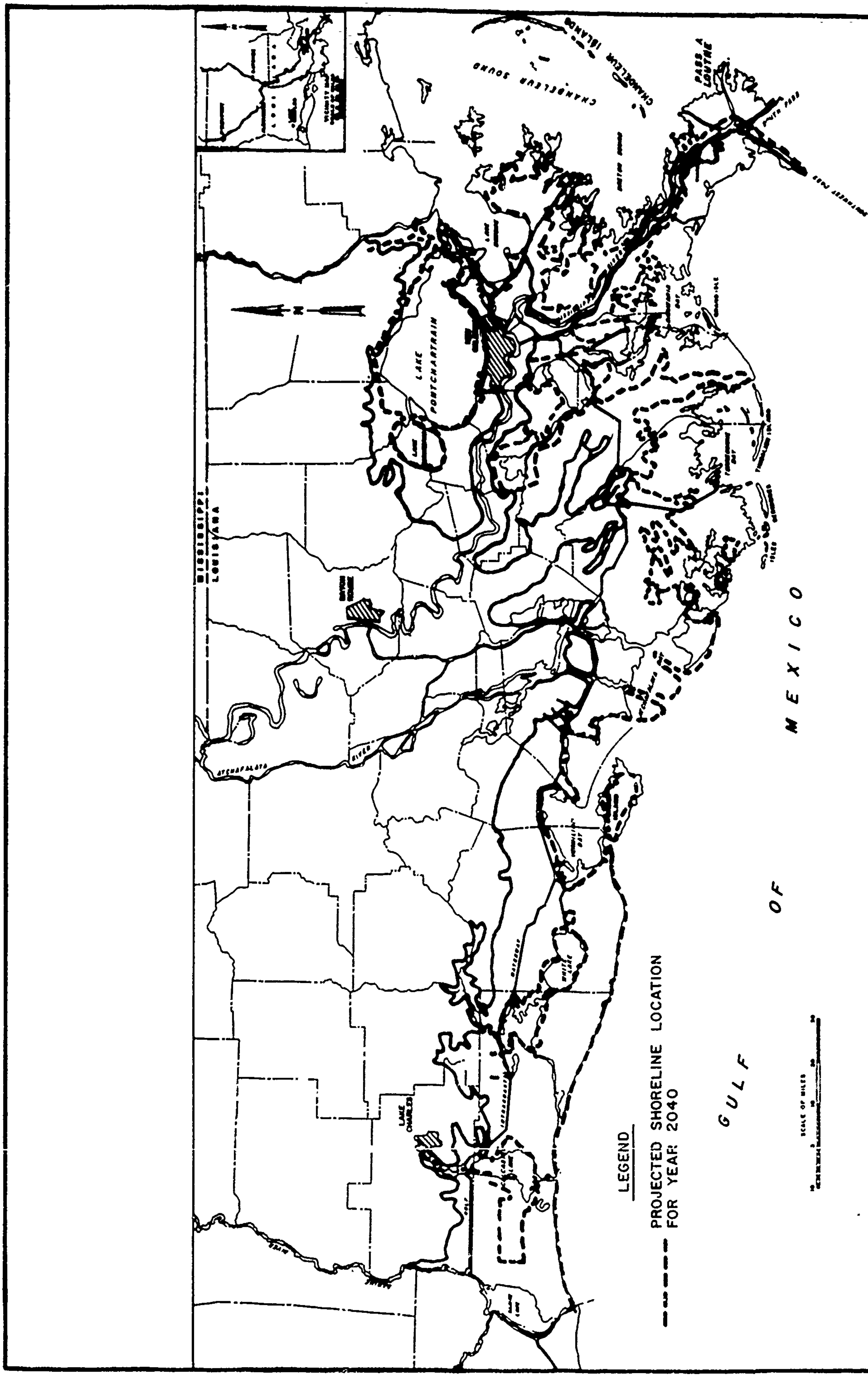


FIGURE 4

FIGURE 4

WATER QUALITY

Water quality in the Louisiana coastal zone by the year 2040 will be significantly different from base year conditions. The principal difference will be due to the large increase in salinity brought about by land loss. All coastal rivers will be subject to more frequent saltwater intrusion of greater duration. The land-water boundary will serve as the coast for the large shallow bays that will be formed. The quality of this water will be acceptable for fish and wildlife propagation and primary and secondary contact recreation. See Figure 5 for salinity changes between 1990 and 2040.

BIOLOGICAL RESOURCES

If no action is taken to ameliorate coastal land loss and alteration in Louisiana, habitat deterioration will continue its historical trend with concomitant declines in productivity of wildlife and fishery resources. Natural processes such as compaction, subsidence, erosion, sea level rise, and saltwater intrusion will continue to cause severe declines in the quantity and quality of wetland habitat. Approximately 780,500 acres of wetlands and 638,100 acres of productive marshland are projected to be lost to open water by the year 2040. In addition, many areas not converted to open water would become more saline due to saltwater intrusion. The areal extent of low to moderate salinity estuarine nursery areas would be reduced as this zone narrows. These losses represent reduction in forested wetlands and marsh acreage of 24 and 27 percent, respectively.

Wildlife productivity directly depends on both availability and quality of marsh habitat. The serious marsh loss would exert obvious negative impacts. Since the majority of wildlife species prefer lower salinity marsh habitat, increased salinities in the coastal marshes would also adversely affect wildlife. The result would be decreased commercial and

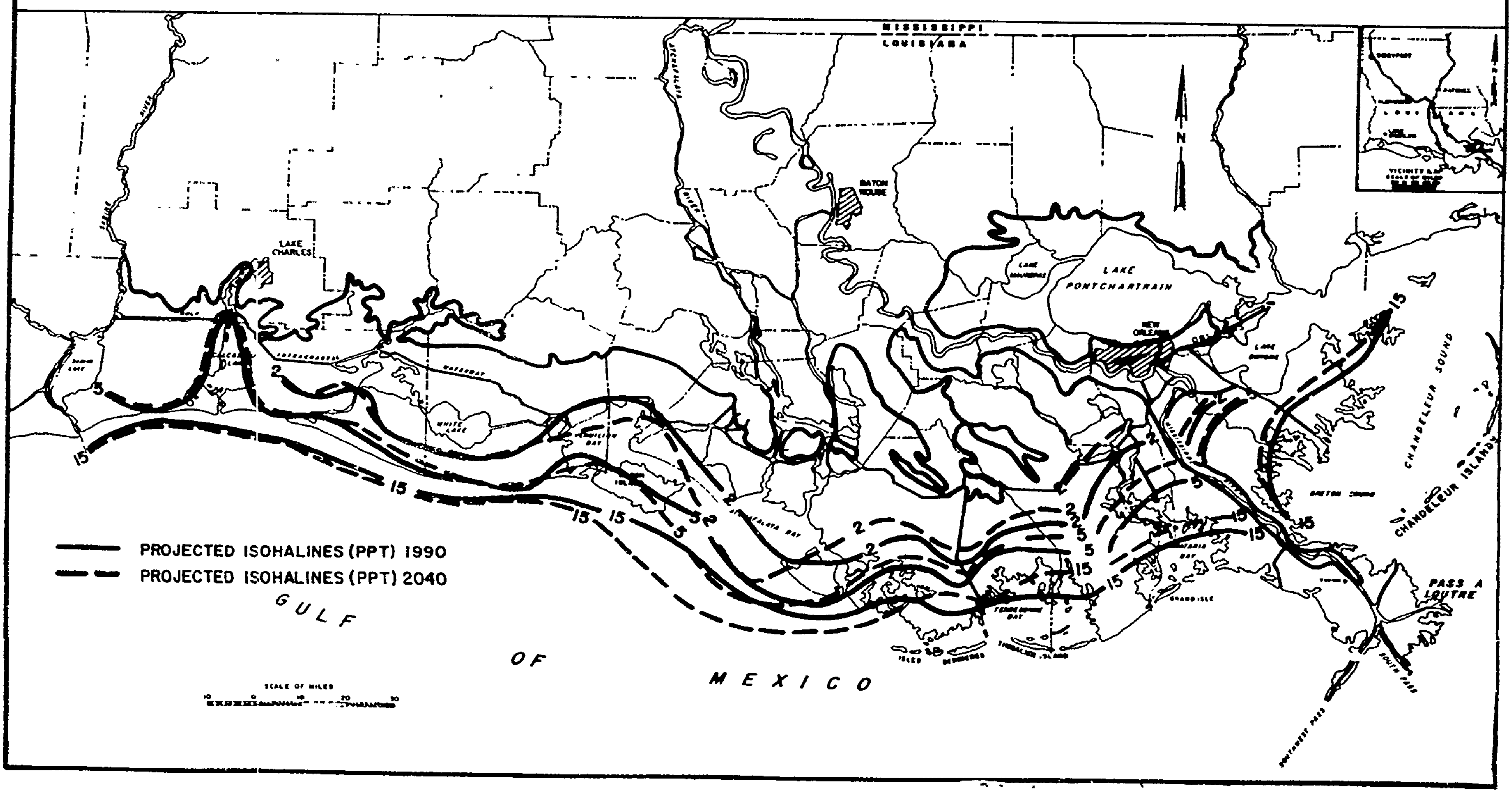


FIGURE 5

FIGURE 5

recreational harvests for furbearers, alligators, waterfowl, and game birds and mammals. Many species highly valuable from an ecological standpoint, but not commercially or recreationally valuable, would also experience adverse impacts.

The implications of marsh deterioration in relation to fishery production are also drastic. Studies point to marshes as being an ecologically limiting factor. The coastal wetlands are generally believed to serve an important role in supporting fisheries and the consensus among fishery experts is that fishery production is closely related to marsh acreage. Marshes provide food and shelter and produce large amounts of organic detritus that is transported into adjacent shallow estuarine water bodies. The importance of this detrital input to the estuarine food web has been well documented by Darnell (1961) and Odum et al. (1973). The vast majority of shellfish and finfish harvested commercially and for sport depend on shallow marsh areas. Harris (1973) stated that total estuarine-dependent commercial fisheries production in coastal Louisiana has peaked and will decline in proportion to the acreage of marshland lost. In the opinion of most fishery biologists, continuation of current trends in habitat reduction and alteration will be accompanied by a diminishing harvest (Craig et al., 1979).

CULTURAL RESOURCES

Prehistoric and historic sites located along the distal edges of the abandoned St. Bernard, Terrebonne, and Lafourche delta lobes would be either destroyed or severely damaged by continued coastal retreat. An estimated 50 percent of the known cultural resources inventory would be adversely affected. The loss of these sites would be irreplaceable. While the erosion rate along the chenier plain is much less than in the deltaic plain in the east, continued land loss would damage or destroy the cultural resource data base in that area as well.

RECREATION RESOURCES

The demand for outdoor recreational opportunities in coastal Louisiana is expected to increase significantly in the future as a result of expanding populations and a decreasing resource base.

Recreational fishing demand is projected to increase from 19.8 million man-days to 29.1 million man-days annually by the year 2040. The recreational hunting demand is projected to increase from 8.8 million man-days to 12.9 million man-days annually by 2040. These are the two recreational activities that predominate in coastal Louisiana. The use projections for these activities are based on a 1980 statewide survey conducted under contract to the State of Louisiana, Department of Culture, Recreation and Tourism.

The continued loss of productive coastal marsh fish and wildlife habitat will adversely affect the associated fish and wildlife-oriented recreation potential. As marsh acreages decline, dollar losses to the potential for recreational hunting and fishing may approach $14,000,000 annually by 2040. In addition, expanded populations, industrial growth, and a shrinking resource base will increase competition between commercial and recreational interests for the balance of the resource that remains.

ECONOMY

Economic growth in the area is primarily due to the availability of natural resources: oil and gas, waterways for transportation, commercial fisheries and wildlife, climate, and water-oriented recreation activities. Projected employment is shown in Table 3. Services, trade, and manufacturing in the study area are projected to increase and mineral production employment is projected to decline. In view of the projected decline in productivity of the estuary, there is little evidence to suggest any significant growth in the numbers of persons

TABLE 3.

NON-AGRICULTURAL EMPLOYMENT PROJECTIONS

	1982	1990	2000	2010	2020	2030	2040
Study Area	820,436	1,124,096	1,257,099	1,367,736	1,410,054	1,448,986	1,488,993
Louisiana	1,555,822	2,131,656	2,383,865	2,592,576	2,672,791	2,746,575	2,822,408

Source: Louisiana Department of Labor, Office of Employment Security, Research and Statistics unit, Employment and Wages, 1982, Tables 3 and 6.

U. S. Department of Commerce, Bureau of Economic Analysis, 1980 OBERS BEA Regional Projections, Vol. 8.

able to earn their entire living as commercial fishermen. The dwindling resource base leads to the conclusion that the total manhours spent in commercial fishing will decline.

HUMAN RESOURCES

Population in the study area is expected to increase from 2,077,934 in 1980 to 3,045,000 in 2040. The population projections are shown in Table 4. The classic pattern of regional urbanization is expected to continue with the population concentrating around large urban areas. As the trend continues through the projected period, the parishes and areas adjacent to urban areas will become more densely settled. The only foreseeable constraint on this trend would be if the developable lands are exhausted. The New Orleans MSA is expected to account for 61 percent of the study area population in 2040.

Per capita income in the area is expected to increase during the study period. By 2040, the study area is estimated to have a per capita income of $19,515. State and national per capita incomes in 2040 are estimated at $19,112 and $19,024, respectively.

IMPACTS OF LAND LOSS

The direct economic impacts resulting from the projected land loss were estimated under two general categories: losses due to the destruction of physical development on the land, and loss of market and non-market values of the and itself.

Impacts under the first category are based on physical loss or the replacement and relocation costs of damages to the following physical developments: roads, highways, and railroads, waterways, public utilities, private oil and gas pipelines, flood control structures, community and agricultural water supply systems, and public, commercial, and residential

TABLE 4

POPULATION PROJECTIONS

Louisiana, the Study Area, Metropolitan Statistical Areas (MSA) in the Vicinity of the Study Area, and Non-Metropolitan Statistical Area Parishes Within the Study Area

Parishes and MSA's	1980 1/	1985 2/	1990 2/	2000 2/	2010 2/	2020 2/	2030 2/	2040 2/
Baton Rouge MSA 4/	494,151	502,000	536,000	585,000	619,000	656,000	694,000	736,000
Ascension Parish	50,068							
Livingston Parish	58,806	110,000	118,000	129,000	137,000	145,000	154,000	163,000
Houma-Thibodeaux MSA	176,876	183,000	193,000	211,000	227,000	241,000	254,000	267,000
Lafourche Parish	82,483	3/	3/	3/	3/	3/	3/	3/
Terrebonne Parish	94,393	3/	3/	3/	3/	3/	3/	3/
Lake Charles MSA	167,223	173,000	183,000	199,000	211,000	223,000	237,000	250,000
Calcasieu Parish	167,223	3/	3/	3/	3/	3/	3/	3/
New Orleans MSA	1,256,668	1,284,000	1,353,000	1,464,000	1,551,000	1,644,000	1,740,000	1,844,000
Jeffersson Parish	454,592	3/	3/	3/	3/	3/	3/	3/
Orleans Parish	557,927	3/	3/	3/	3/	3/	3/	3/
St. Bernard Parish	64,097	3/	3/	3/	3/	3/	3/	3/
St. Charles Parish	37,259	3/	3/	3/	3/	3/	3/	3/
St. John the Baptist Parish	31,924	3/	3/	3/	3/	3/	3/	3/
St. Tammany Parish	110,869	3/	3/	3/	3/	3/	3/	3/
Non-MSA Parishes	368,293	381,000	400,000	425,000	447,000	470,000	497,000	521,000
Assumption Parish	22,084	22,000	23,000	24,000	25,000	26,000	27,000	28,000
Cameron Parish	9,336	9,000	10,000	10,000	11,000	12,000	13,000	14,000
Iberia Parish	63,752	67,000	70,000	75,000	79,000	83,000	87,000	91,000
Jefferson Davis Parish	32,168	33,000	35,000	37,000	40,000	44,000	47,000	51,000
Plaquemines Parish	26,049	27,000	27,000	28,000	29,000	30,000	31,000	32,000
St. James Parish	21,495	22,000	22,000	24,000	24,000	24,000	26,000	26,000
St. Mary Parish	64,253	68,000	71,000	73,000	77,000	80,000	85,000	89,000
Tangipahoa Parish	80,698	82,000	89,000	97,000	102,000	108,000	115,000	121,000
Vermilion Parish	48,458	51,000	53,000	57,000	60,000	63,000	66,000	69,000
Total Study Area	2,077,934	2,131,000	2,247,000	2,428,000	2,573,000	2,723,000	2,882,000	3,045,000
Louisiana	4,206,312	4,297,000	4,539,000	4,901,000	5,582,000	5,582,000	5,780,000	6,202,000

1/ U. S. Dept. of Commerce, Bureau of the Census, 1980 Census of Populations, "Number of Inhabitants, Louisiana".
2/ U. S. Dept. of Commerce, Bureau of Economic Analysis, 1980 OBERS Southeast BEA Regional Projections, Vol. 8. Projections shown in this table have been based on the OBERS data.
3/ Projections shown in MSA total.
4/ In addition to Ascension and Livingston Parishes, the Baton Rouge MSA includes East and West Baton Rouge Parishes.

and residential buildings. The damaged features were identified using the projected coastline for 2040 and the best available published data, primarily maps and aerial photography, obtained from Federal and state sources. Estimates of dollar impacts on individual features and the point of occurrence of the impact within the 50-year period of projection were based on professional judgment.

Impacts under the second category of loss are based on an estimated average market value for all lands projected to be lost ($300/acre) and an estimate of the annualized economic loss of nonmarket contributions of the marshland as reflected in the following market categories: commercial fishing, commercial trapping, and recreational hunting and fishing.

Among the losses or impacts not evaluated are second-round employment and business losses in affected industries, the function of the marsh as a substitute for tertiary waste treatment, buffering effects on storm-related tidal surges, and features not identified because of relatively dated published source documents and maps.

All impacts were then discounted using present worth methods and an interest rate of 8 1/8 percent, and expressed as an average annual value at 1983 price levels. The total present value of these impacts is approximately $750 million, or about $62 million per year when expressed as an average annual value.

WATER SUPPLY PROBLEMS AND OPPORTUNITIES

Major water resources problems in the coastal area include land subsidence, shoreline and beach erosion, flooding, insufficient water supply, poor water quality, saltwater intrusion, reduced fish and wildlife productivity, and inadequate recreation access. Because of the size of the area and the complicated nature of the problems, the current study was divided by

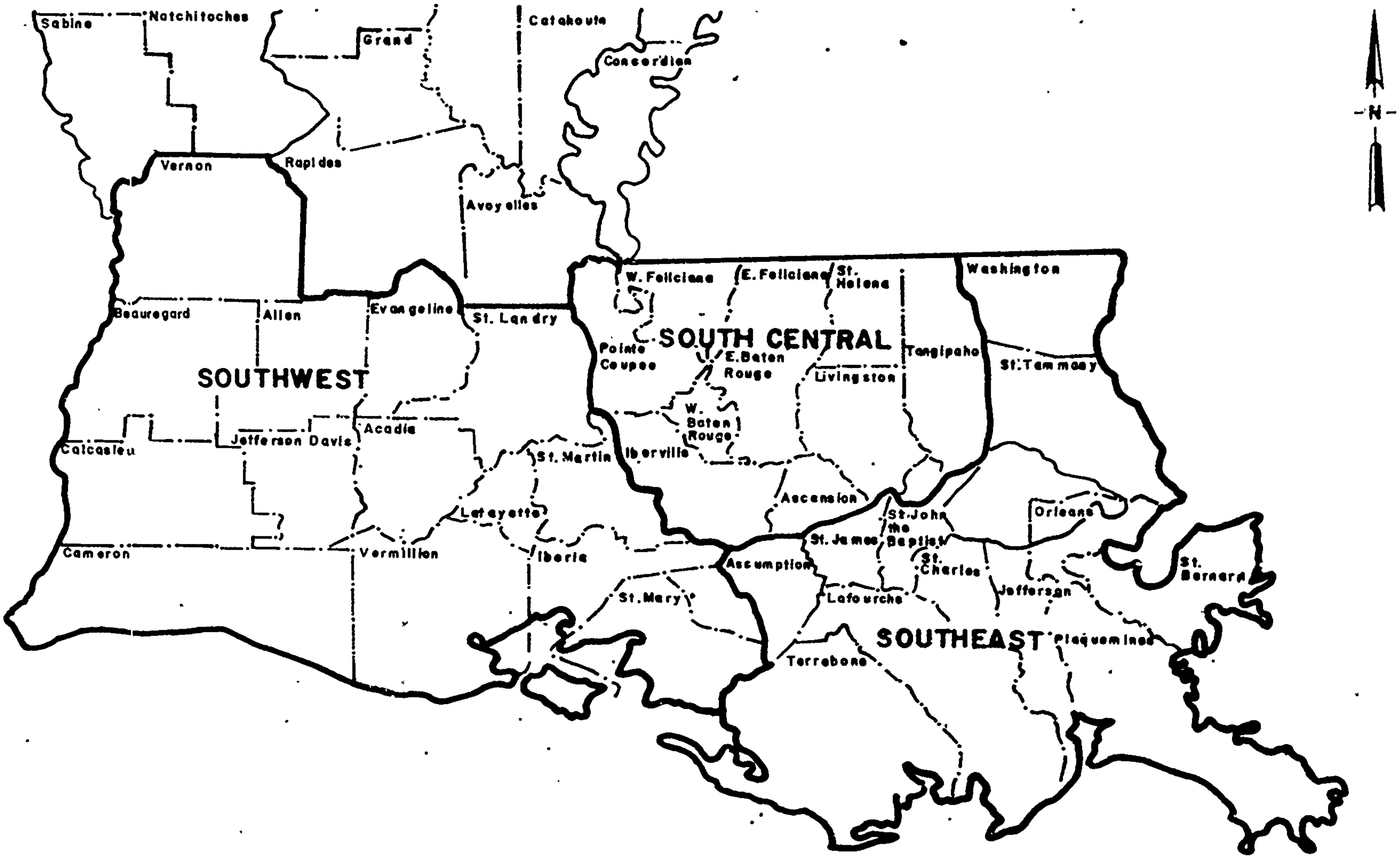
purpose into a land loss and marsh creation study, a shore and barrier island study, and a water supply study and presented in three separate interim reports. This report focuses on water supply.

Water supply withdrawals in the study area amounted to nearly 11 billion gallons per day in 1980; 87 percent was from surface water sources. Major water withdrawals were made for public supplies in coastal communities and for industrial, power, irrigation, and aquaculture uses. Major surface water sources in the study area besides the Mississippi River are the Atchafalaya River, the GIWW, the Mermentau River, the Vermilion River, Bayou Teche, the Calcasieu River, and Bayou Lafourche. Louisiana's barrier islands and coastal marshes protect a number of freshwater sources from the intrusion of saltwater. These natural barriers are being converted to open water at a rate of about 39 mi2/yr and the rate is projected to increase. As the marshlands are converted to open water, more avenues for the intruding saltwater are created. Eventually, new water supply sources will have to be found as some of the present ones become contaminated with saltwater. Current supplies are frequently subject to saltwater intrusion and many coastal communities are seeking alternative sources of fresh water.

To facilitate analysis of the water supply problem, the study area was divided into three water resources planning areas (WRPA): the Southeast area, the South Central area, and the Southwest area (see Figure 6). The analysis was made by parishes within the WRPA. The WRPA's were extended outside the coastal area to include all parishes using the same hydrologic resources.

SOUTHEAST WRPA

The Southeast WRPA contains the coastal parishes of Assumption, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Tammany, and Terrebonne.



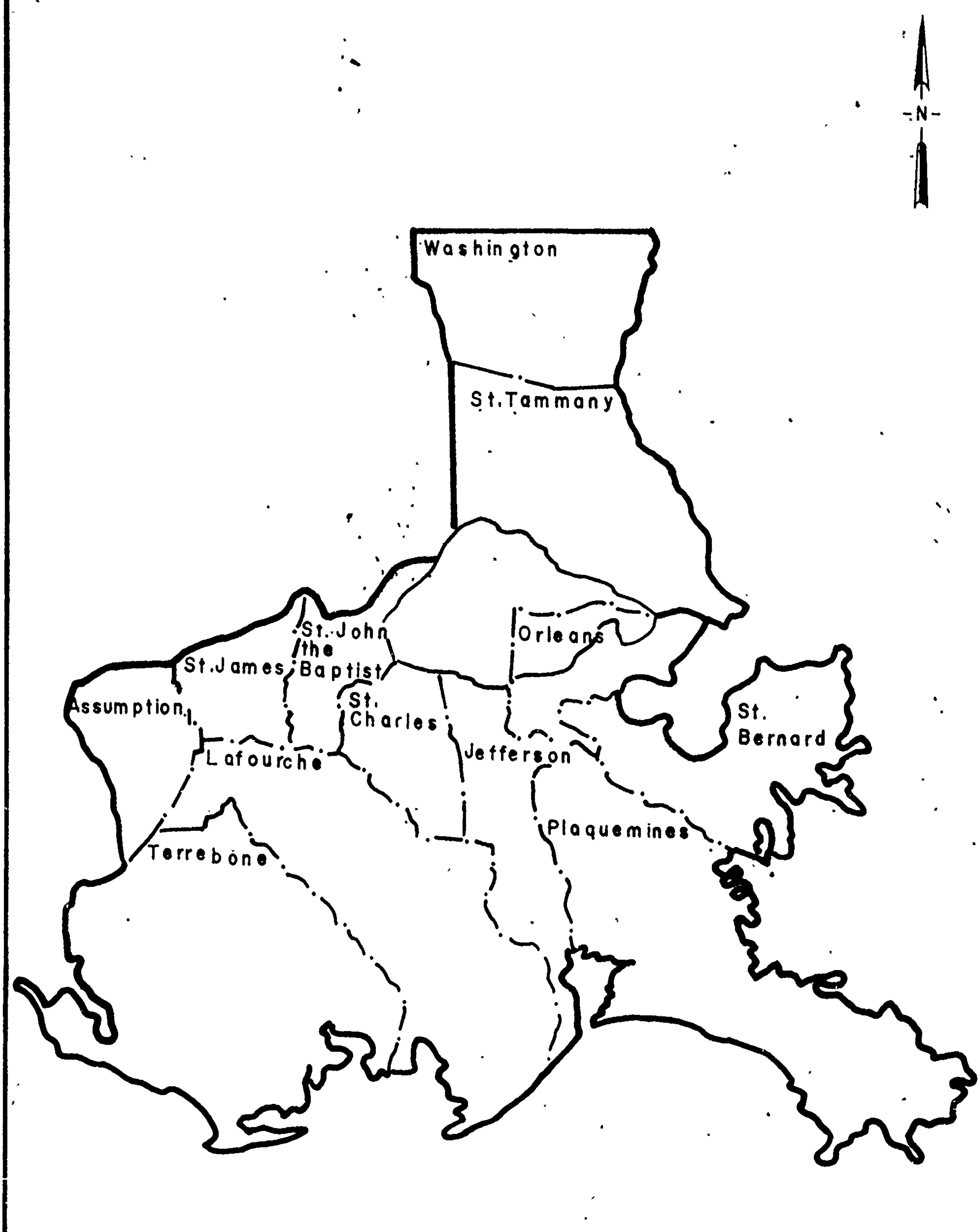
Water Resource Planning Areas

Washington Parish, which is outside the coastal zone, is included in the WRPA because it competes with the coastal parishes for available water supplies. Figure 7 shows the parishes in the Southeast WRPA.

The study period extends 50 years from 1990 to 2040. The data for 1990 and 2020 were projected in the September 1982 Louisiana Office of Public Works report, Water Requirements and Availability for Louisiana, 1980-2020, prepared by Urban Systems Associates, Inc. The 2040 needs were obtained using a linear regression program to extend the data presented in the Office of Public Works report.

The water supply needs for the Southeast WRPA from 1990 through 2040 are shown in Table 5. The need is mostly for surface water. The 1990 need totals 9,516 million gallons per day (MGD), 98.7 percent of which is surface water. By 2040, the need is expected to be 16,813 MGD, an increase of 77 percent. The largest increases are expected to result from urban-type development in historically rural parishes. Large increases are projected for Lafourche, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, and Tammany Parishes Growth rates will vary from 45 percent in St. Charles Parish to 61.2 percent in St. John the Baptist parish.

While there are a number of problem areas in the WRPA, none is a result of absolute quantities of water available. The 16,597 MGD surface water need in 2040 can easily be satisfied by the Mississippi River and, in the case of Washington Parish, the Bogue Lusa Creek and the Pearl River. The small 2040 groundwater need (215 MGD) could be satisfied by the abundant groundwater resources in the area. Groundwater resources of the Florida Parishes immediately north of Lake Pontchartrain are some of the largest sources of fresh water in Louisiana. Wells in the area typically yield from 500 to over 4,000 gallons per minute. Therefore, because of the tremendous availability of surface and groundwater, there are no water supply problems in the Southeast WRPA relative to absolute water quantity.



Southeast WRPA

FIGURE 7

TABLE 5

WATER NEEDS - SOUTHEAST WRPA

Million Gallons Per Day

Parish	1990 1/ Ground	1990 1/ Surface	2020 1/ Ground	2020 1/ Surface	2040 1/ Ground	2040 1/ Surface
Assumption	4	32	3	53	5	83
Jefferson	8	1,618	5	1,553	4	1,683
Lafourche	0	44	0	61	0.2	81
Orleans	29	760	17	602	18	652
Plaquemines	0	209	0	331	0.3	496
St. Bernard	1	889	1	1,415	1	2,179
St Charles	6	4,082	1	4,878	0.6	5,950
St. James	5	1,489	1	2,419	0.4	3,766
St. John the Baptist	5	224	5	520	8	1,622
St. Tammany	40	0	74	0	120	0.3
Terrebonne	0	14	0	25	0.02	44
Washington	32	23	36	36	57	40
	130	9,386	143	12,393	215	16,597

1/ Water Requirements and Availability for Louisiana 1980-2020 September 1982.

2/ U. S. Army Engineer District, New Orleans.

While the total water quantity is large, local water quality problems do exist. Several communities located close to the fresh/saline interface such as Grand Isle, Houma, and communities in Plaquemines Parish experience saltwater intrusion. The River Parishes area from Baton Rouge to St. Charles Parish depends entirely on the Mississippi River for freshwater supply. Just upstream of this area is the heavy industrial corridor in the 90-mile reach above New Orleans. More than 260 spills a year occur in this reach of the river, causing pollution and raising the fear of extended contamination.

Grand Isle. The town of Grand Isle is located on the outer coast in the southern tip of Jefferson Parish and is isolated from any source of fresh water. The majority of the town is on a barrier island that lies at the point where the Barataria Basin and the Gulf of Mexico meet. The island is a narrow beach ridge, characteristically 6 to 10 feet above sea level. Grand Isle is a center for local seafood and fishing industries, a staging area for offshore oil exploration and production, and an excellent setting for recreation activities. At present, the town of Grand Isle purchases water from Lafourche Water District #1. The town has a long-term contract with Lafourche Parish for 500,000 gallons per day that the town purchases at Leeville, Louisiana, about 12 miles west of Grand Isle. The water is supplied to the town via a 25-year old, 8-inch water line.

The permanent population of Grand Isle is about 2,500. The figure can be increased by 4,500 to 5,000 in the summer months and by another 4,000 on summer weekends. This puts the number of summer residents at about 11,000 on the weekends and about 7,000 all summer long. A 100-acre state park is also located on Grand Isle. During the summer, 16,000 people visit the park on weekends. A definite need exists for 900,000 gallons of fresh water per day in the peak months with a future potential for 1,000,000 gallons per day. With an existing capacity limited to 500,000 gallons per day, there is a definite need for an additional 500,000 gallons per day of fresh water.

City of Houma. The City of Houma in Terrebonne Parish currently uses the GIWW as a source of fresh water. The GIWW is connected to the Houma Navigation Channel, which has become an avenue for saltwater intrusion. During extended dry periods accompanied by strong southerly winds, the water near the intake becomes salty and an alternate source, Bayou Black, must be used. However, Bayou Black is also connected to the GIWW so its use for fresh water is limited. A preliminary engineering report on the water requirements of Terrebonne Parish by Gulf South Engineers, Inc., dated 1983 lists the 2020 Houma system needs at 12 MGD. Records show that the saltwater problems persist for 50 days. Therefore, there is a need in Houma for an additional water supply of 12 MGD capacity with a 50-day duration.

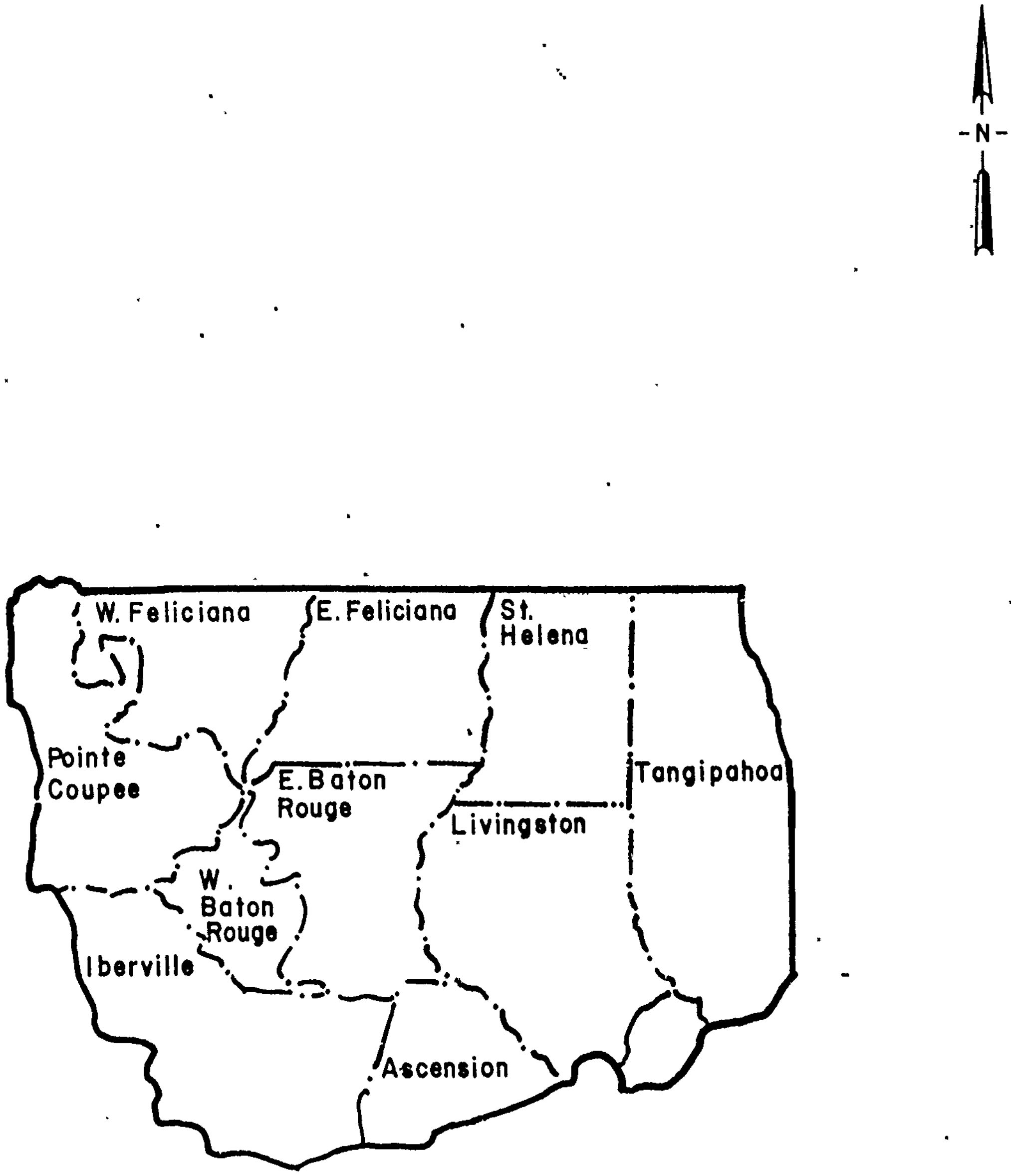
Plaquemines Parish. Plaquemines Parish draws its fresh water from the Mississippi River, the only large source of fresh water available. During periods of low flow on the river, the denser saltwater forms a wedge that intrudes upsteam from the river's mouth on the Gulf of Mexico. The saltwater wedge has been observed as far as 140 miles upstream, about 15 miles above New Orleans. At the time of the observation, the flow in the river was less than 100,000 cubic feet per second (cfs). Based on historical data collected since 1939, estimates of upstream migration of the saltwater wedge can be made. At a discharge of 125,000 cfs, the saltwater wedge should be located near downtown New Orleans. This low flow has occurred on an average of once every 4.2 years (USGS, 1980). Salinities exceeding U.S. Environmental Protection Agency standards occur annually at the Boothville-Venice and Pointe-a-la-Hache waterworks in Plaquemines Parish. The parish has responded to the saltwater problem by using storage tanks, interconnecting downstream systems with more upstream systems, diluting water with fresh water from storage, and by promoting conservation. Even with these measures, the systems were severely tested in the fall of 1983. Land loss from erosion and subsidences along with the higher sea levels that are projected will greatly aggravate the saltwater

problems in Plaquemines Parish. In the not too distant future, an alternative water supply source needs to be developed.

<u>River Parishes</u>. The Mississippi River is the primary source of municipal and industrial water for these parishes except for a few industrial wells. In this reach 1,500,000 people use approximately 214 MGD. Concern is growing over possible contamination or pollution of the Mississippi River water as a result of the recurring spills. According to U.S. Coast Guard records, there were 2,616 spills in the Mississippi River between river miles 65 and 115 in the last 10 years, an average of one spill every other day. Spills are caused by river vessels, industry, pipelines, and other facilities. Seventy-three percent of the spills were oil, 2 percent were chemicals, 2 percent were waste, and 23 percent were unknown materials. The oil spills are not necessarily harmful. However, the chemicals and other materials could be hazardous to human health. As a mitigation measure against contamination of water supplies, the LDNR, Division of Water Pollution Control (DWPC), and the Department of Health and Human Resources, Office of Health Services and Environmental Quality, have developed an early warning system. The system is designed so that a facility experiencing an accidental s[illegible]n notify all downstream water users and the DWPC within minutes. The warning system is helpful but it does not prevent spills or the resulting damage. A large chemical spill could still cause water supply systems to be shut off for an extended period. Accordingly, many of the water suppliers feel that an alternative source of water should be developed to protect against hazardous spills.

SOUTH CENTRAL WRPA

The South Central WRPA is made up of the coastal parishes of Ascension, Livingston, and Tangipahoa, and parishes outside the coastal area, East and West Baton Rouge, East and West Feliciana, Iberville, Point Coupee, and St. Hele[illegible]a. The parishes within the WRPA are shown on Figure 8.



South Central WRPA

FIGURE 8

The water supply needs for the South Central WRPA from 1990 through 2040 are shown in Table 6. The need is greatest for surface water. The 1990 need totals 2,772 MGD, 89 percent of which is surface water. By 2040, the need is expected to be 4,475 MGD, an increase of 60 percent. Largest increases are projected in Ascension, Livingston, Tangipahoa, East and West Baton Rouge, East and West Feliciana, and St. Helena Parishes. Growth in these parishes is expected to vary from 130 percent in Ascension to 360 percent in Livingston.

The water supply resources of the South Central WRPA are more than adequate. The Mississippi River can satisfy the surface demand and the Quaternary, Pliocine, and Miocine aquifers contain a plentiful supply of groundwater. Even with the increase projected for 2040, the available supplies of water far exceed the projected needs.

SOUTHWEST WRPA

The Southwest WRPA is made up of the coastal parishes of Calcasieu, Cameron, Iberia, Jefferson Davis, St. Mary, and Vermilion, and the parishes outside the coastal area, Acadia, Allen, Beauregard, Lafayette, St. Landry, St. Martin, Vernon, and Evangeline. The parishes within the WRPA are shown on Figure 9.

The water supply needs for the Southwest WRPA from 1990 through 2040 are shown in Table 7. The 1990 need totals 3,163 MGD, 62 percent of which is surface water. By 2040, the need is expected to be 4,306 MGD, an increase of 36 percent. The largest increases are expected in Lafayette, St. Landry, Vernon, and Evangeline Parishes. Growth in these parishes is expected to vary from 55 percent in Evangeline Parish to 220 percent in Lafayette Parish. The largest increase in the coastal parishes, 33 percent, is expected to be in Vermilion Parish.

TABLE 6

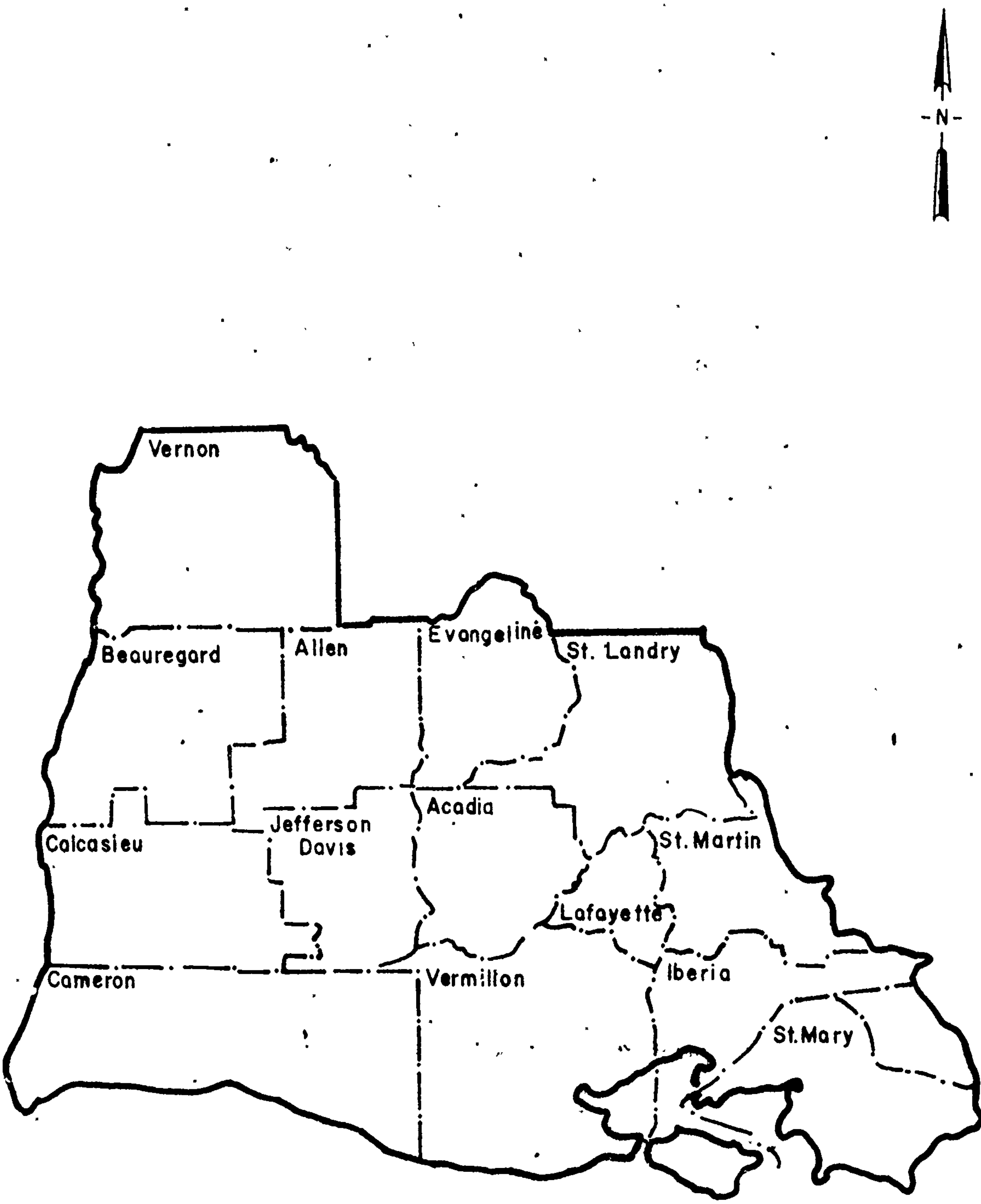
WATER NEEDS - SOUTH CENTRAL WRPA

Million Gallons Per Day

Parish	1990 1/ Ground	1990 1/ Surface	2020 1/ Ground	2020 1/ Surface	2040 2/ Ground	2040 2/ Surface
Ascension	16	264	42	396	86	566
Livingston	12	0	27	0	54	.06
Tangipahoa	24	1	52	1	89	0.7
East Baton Rouge	162	133	248	264	321	430
West Baton Rouge	11	9	16	25	19	56
East Felici@na	2	3	4	10	7	15
West Feliciana	10	110	12	261	13	460
Iberville	44	1,451	46	1,588	47	1,779
Point Coupee	18	500	22	500	26	500
St. Helena		1	3	0	4	.06
	300	2,472	472	3,045	668	3,807

1/ Water Requirements and Availability for Louisiana 1980-2020 September 1982.

2/ U. S. Army Engineer District, New Orleans.



Southwest WRPA

FIGURE 9

Table 7

WATER NEEDS - SOUTHWEST WRPA

Million Gallons Per Day

Parish	1990 1/ Ground	1990 1/ Surface	2020 1/ Ground	2020 1/ Surface	2040 2/ Ground	2040 2/ Surface
Calcasieu	206	480	232	501	270	518
Cameron	12	69	14	88	15	109
Iberia	40	31	59	30	87	31
Jefferson Davis	185	152	214	176	234	204
St. Mary	9	187	12	195	16	205
Vermilion	76	541	96	633	114	704
		139	221	149	240	156
Allen	78	14	63	11	54	9
Beauregard	46	13	50	12	56	12
Lafayette	42	4	78	3	145	3
St. Landry	80	51	134	95	200	157
St. Martin	36	60	40	69	50	79
Vernon	2	0.3	7	0	7	0
Evangeline	171	234	255	252	361	269
	1,189	1,974	1,474	2,214	1,851	2,455

1/ Water Requirements and Availability for Louisiana 1980-2020, September 1982.

2/ U. S. Army Engineer District, New Orleans.

Generally, groundwater resources in the Southwest WRPA are adequate. The entire WRPA is served mainly by the Chicot acquifer and, except for some isolated locations, the groundwater is fresh and plentiful. Preliminary estimates indicate that the Chicot aquifer can sustain combined withdrawals of at least 1,550 MGD (Gulf South Research Institute). According to the Lower Mississippi Region Comprehensive Study (1974), the total yield of available groundwater within the study area is 2,609 MGD, based on a draw-down of 4 feet per year. While these estimates could not be verified, they were considered to be within the reconnaissance scope of this study. The USGS is working on a mathematical model of the Chicot aquifer. The model, which will be used to determine the yield and capacity of the aquifer among other things, is scheduled for completion in late 1985.

There are two problem areas in the Southwest WRPA: the coastal Cameron-Holly Beach area where the groundwater source from the Chicot aquifer is brackish, and the Mermentau River Basin where there is already a need for surface water, a need that will grow substantially by the year 2020.

Cameron-Holly Beach. The communities of Cameron-Holly Beach presently obtain their water for public supply from a portion of the Chicot aquifer. The communities are apparently located astride the fresh-saline water interface where saltwater intrudes into the aquifer. The water from the well at this location has relatively high concentrations of chlorides (447 mg/l of chloride, Department of Health and Human Resources, 1983) and sodium (369 mg/l of sodium, DHHR, 1983). The only river in the vicinity of Holly Beach is the Calcasieu, considered to be the most acute water quality problem in the state. In addition to being adversely affected by industrial and municipal effluents, the Calcasieu River below Lake Charles is also being affected by saltwater intrusion. An additional source of fresh water is needed in this area.

Mermentau River Basin. The water supply system in the Mermentau River Basin includes the Mermentau River and Grand and White Lakes. This system is the main freshwater source for Evangeline, Acadia, Vermilion, Cameron, and Jefferson Davis Parishes, principally for agricultural irrigation. The parishes withdrew nearly 569 MGD from the Mermentau River system in 1980 and demands from this source are expected to be near 735 MGD by the year 2020. At low-flow conditions, the river has zero discharge. During these periods, Grand and White Lakes function as a freshwater reservoir, supplementing streamflow on the river. A problem occurs, however, when demand is extremely heavy during low-flow conditions. As withdrawals increase, salinity levels in the lakes become increasingly higher. Farmers using irrigation water from sources connected to these lakes must suspend irrigation withdrawals until flow conditions improve. Cameron and Vermilion Parishes are the most influenced by the low flow since both take the water d[illegible]y or indirectly from White Lake. If the 2020 and 2040 needs are [illegible]t, an additional source of freshwater must be developed.

PLAN FORMULATION

PLANNING CONSTRAINTS

Legislative and executive authorities specify planning constraints and criteria that must be applied when evaluating alternative plans and the range of impacts to be assessed. In developing plans, tangible and intangible benefits and costs are considered as well as effects on the ecological, social, and economic well-being of the region. Federal participation in development requires that any plan be complete within itself, efficient and safe, economically feasible in terms of current prices, environmentally acceptable, and consistent with local, regional, and state plans.

The Louisiana coastal area is vast, containing 9.2 million acres and a multitude of water resources problems. The scope of this report, as it relates to water resources problems, was limited to water supply.

PLANNING OBJECTIVES

Planning objectives are the national, state, and local water and related land resources management needs specific to a study area that may be addressed under a given study authority. Because of the study scope limitation, this interim report has as the single planning objective to determine alternative methods to furnish sufficient water to satisfy water supply needs of the Louisiana coastal area.

MANAGEMENT MEASURES

To address the planning objective, a list of resource management measures was developed. The measures are those suggested by the public and interested Federal, state, and local agencies. Both structural and nonstructural measures were included. Table 8 lists the management measures considered in this study.

TABLE 8

MANAGEMENT MEASURES

Louisiana Coastal Area

1. Pipelines	6. Saltwater barriers
2. Diversion channels	7. Treatment plants
3. Reservoirs	8. Desalinization plants
4. Underground storage	9. Barge in supply
5. Wells	

DEVELOPMENT OF ALTERNATIVE PLANS

Based on the management measures and the planning objective of the study, 27 alternative plans were developed. The alternative plans used one or more of the management measures to satisfy the planning objective. Six locations with water supply problems were identified. These concepts guided formulation of the alternatives to provide fresh water for the six locations:

- Develop alternative sources of water
- Redistribute flow by storage
- Import water supplies
- Treat for reuse
- Desalinate water source
- Prevent intrusion of saltwater

The following plans were formulated using these concepts.

GRAND ISLE

Both surface and groundwater sources in the vicinity of Grand Isle are brackish or saline and the present supply is imported from Leeville, Louisiana. Additional supplies can be obtained by importation, desalinization, or by wastewater treatment. Five plans were formulated based on these concepts:

Plan 1	Import additional water via pipeline from Leeville.
Plan 2	Remove salt from seawater with desalinization plant.
Plan 3	Remove salt from brackish groundwater with desalinization plant.
Plan 4	Recapture wastewater and purify in treatment plant for reuse.
Plan 5	Import water by barge.

HOUMA AREA

The City of Houma surface water supplies are periodically polluted by saltwater intrusion and the groundwater supply is brackish. Freshwater supplies can be assured by preventing saltwater intrusion into the surface source, by importing either ground or surface water and by redistributing available fresh water with storage. Based on these concepts, four plans were formulated.

Plan 6	Prevent saltwater intrusion by constructing gated barrier in Houma Navigation Canal.
Plan 7	Import water via pipeline for Lafourche Parish systems.
Plan 8	Import groundwater from Assumption Parish.
Plan 9	Redistribute Intracoastal Waterway supply by storage.

PLAQUEMINES PARISH

Plaquemines Parish obtains its water from the Mississippi River. The groundwater in the area is brackish. During periods of low Mississippi River flow, parish intakes are affected by saltwater. Alternative supplies could be made available during these low flow periods by importing water and redistributing flow by storing water. Three plans were formulated based on these concepts.

Plan 10	Import raw water from intake in Mississippi River at upstream location.
Plan 11	Redistribute Mississippi River flow by storing water in underground aquifer.
Plan 12	Redistribute Mississippi River flow by storing water in lower Plaquemines Parish.

RIVER PARISHES

At present, the Mississippi River at present is the only source of freshwater for most of the communities in the River Parishes. Groundwater is available only at isolated locations. In the event the Mississippi River is polluted and not available as a source, water supplies could be obtained from prearranged storage or by importation. Six plans were formulated using these concepts.

Plan 13	Redistribute Mississippi River flow by storing water at Davis Pond diversion site.
Plan 14	Redistribute Mississippi River flow by storing water at site of Big Mar freshwater diversion.
Plan 15	Import water via pipeline from Lake Maurepas.
Plan 16	Import water via pipeline from Mississippi River at site near Baton Rouge.
Plan 17	Redistribute Mississippi River flow by storing water in underground aquifer.
Plan 18	Develop groundwater beneath Lake Pontchartrain as source of supply.

CAMERON-HOLLY BEACH

Both ground and surface water supplies in the Cameron-Holly Beach area are affected by saltwater intrusion. Available fresh water could be obtained from surface and groundwater sources north of the saline-freshwater interface. Five plans were formulated for this area.

Plan 19	Import water from the Lake Charles supply system to Cameron-Holly Beach area via pipeline.
Plan 20	Import water from Intracoastal Waterway east of Calcasieu Lock via pipeline.

Plan 21 Remove salt from brackish water at desalinization plant.

Plan 22 Import groundwater via pipeline from site well north of saline-freshwater interface.

Plan 23 Recapture wastewater and purify in treatment plant for reuse.

MERMENTAU RIVER BASIN

The Mermentau River has zero flow during dry conditions. The groundwater source, while adequate, will be used to capacity by 2040. Therefore, methods of obtaining additional supplies are limited to importing water from other basins and redistributing water from flood periods to dry periods by storage at a number of locations in the basin. Four plans were formulated.

Plan 24 Redistribute flow of Mermentau River by storing water in Grand and White Lakes.

Plan 25 Redistribute flow of Mermentau River by storing water in White Lake.

Plan 26 Redistribute flow of Mermentau River by storing water in leveed area north of the Gulf Intracoastal Waterway.

Plan 27 Import water from Atchafalaya River via Bayou Plaquemine Brule'.

COMPARATIVE ASSESSMENT AND EVALUATION OF PLANS

The assessment and evaluation is the result of reconnaissance scope engineering and environmental studies. The economic feasibility of the alternative plans is stated except where the general magnitude of the benefits and costs are not known. The scope of this assessment and evaluation permits the alternative plans to be compared and screened based

on preliminary analyses, and the more likely feasible alternatives to be identified for detailed study. In conjunction with the assessment and evaluation of the plans, a preliminary analysis was made to determine whether benefits to be derived from a plan would support construction of a project. Results of this analysis are discussed by problem areas.

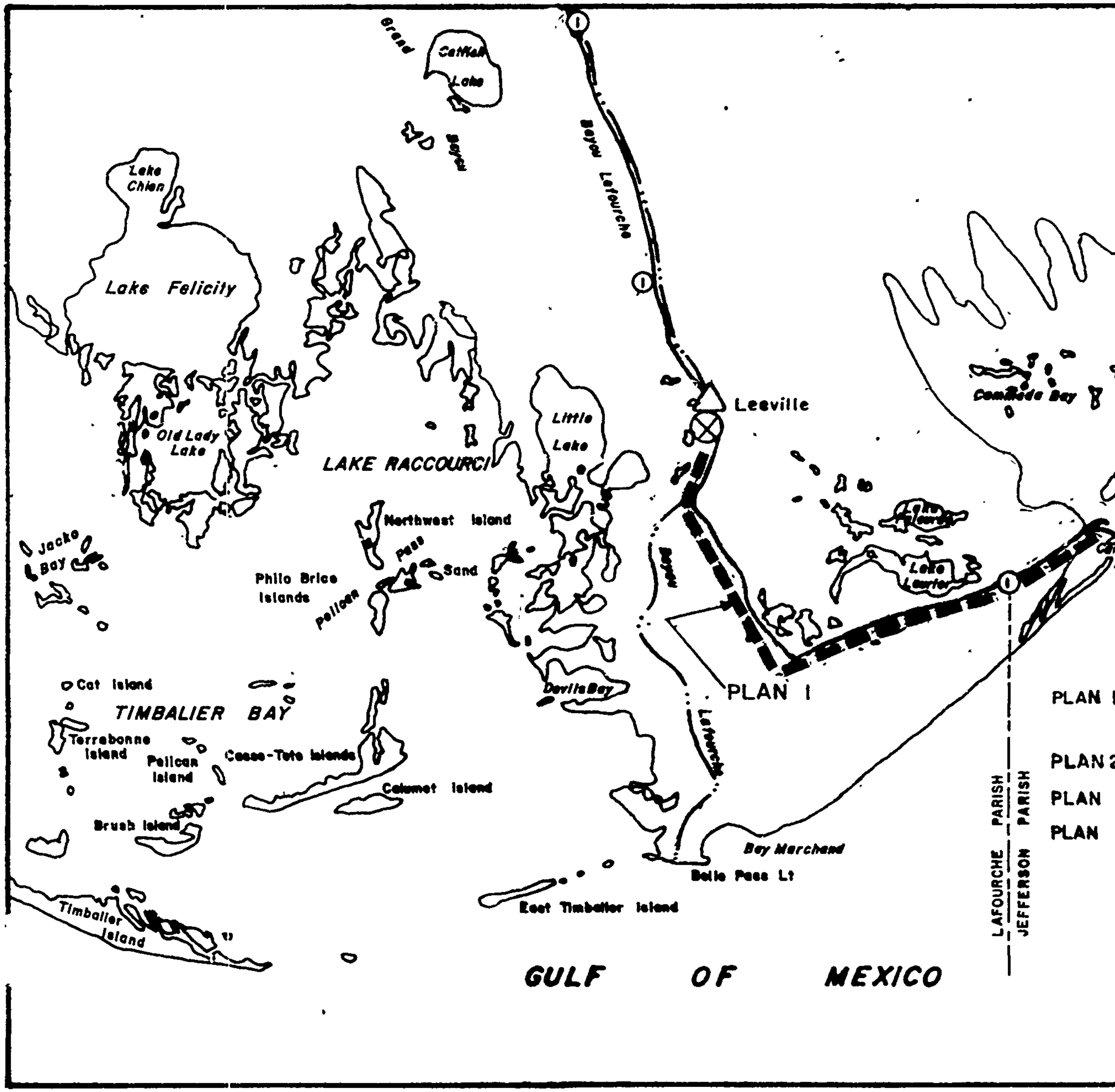
GRAND ISLE

Both surface and groundwater resources in the vicinity of Grand Isle are contaminated with saltwater. Alternatives considered include desalinization, partial treatment of waste, and importation of water from an outside source. The water supply needs for this area in 2020 would be 1 million gallons per day (MGD).

Plan 1. This alternative would upgrade the existing supplies by increasing the imported quantity from Leeville from 500,000 gallons per day (GPD) to 700,000 GPD. Seven hundred thousand gallons per day is the maximum amount available from the Leeville system. This amount would supply 70 percent of the Grand Isle 2020 needs.

The plan consists of replacing the existing 8-inch pipeline from Leeville to Grand Isle with a 12-inch pipeline (see Figure 10). Two booster pump stations would be modified and a third booster station constructed. A 250,000-gallon storage tank would be added to the system. Eighteen and one-half miles of 12-inch pipeline would be required. The first cost of the plan would be $5,200,000 (see Table 9). The annual costs including operation and maintenance would average $645,000.

All construction would be accomplished on existing pipeline rights-of-way except for the pumping station and the storage tank. Pipeline construction would be in previously disturbed marsh fringes and altered water bottoms so



LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR
GRAND ISLE

U S ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 10

IGURE 10

TABLE 9

GRAND ISLE - PLAN 1

Upgrade Existing System with Additional Imports from Leeville

Real Estate: 1 acre fee, 70 acres construction easement	$ 851,000 1/
Pipeline, 12 in.	2,031,000
Pumping Stations	
Booster, 2 pumps-1.56 cfs	176,000
Storage tank & booster pump-1.56 cfs	468,000
Mitigation, 1 acre of wetland	2,000
Subtotal	$3,528,000
Contingencies (25%)	672,000
Subtotal	$4,200,000
Engineering and Design (11%)	500,000
Supervision and Administration (11%)	500,000
TOTAL - PLAN 1	$5,200,000
Operation and Maintenance	$ 212,000

1/ Includes contingencies

impacts would be minimal. Ditching operations would cause loss of natural cover and topsoil that, in turn, would result in temporary loss of habitat and increased runoff, erosion, and turbidity. Following placement of the pipe, the ditch would be backfilled and sediment loads and turbidity would increase only temporarily. The vegetation should return after backfilling is complete. However, the area would be lower than the adjacent marsh and would subside sooner.

Displacement and removal of benthic organisms would occur as a result of construction of subaqueous crossings at Bayou Thunder Von Tranc and Caminada Pass. Construction of the crossings would also cause temporary increases in turbidity, gill clogging, reduction in light penetration, and adverse effects on water quality. The pipeline would be buried and would be a barrier to organisms. The benthic community should recover following pipeline placement. Pumping station and storage tank construction would affect an acre of marsh.

No endangered species are in the area of direct construction. Nesting colonies of brown pelicans are on Queen Bess Island, but would be far removed from construction. Several shell middens that could be of archeological significance are located adjacent to the present pipeline rights-of-way. Good construction practices could limit impacts on these sites. The Wisner State Wildlife Management Area is within the project area and adjacent to the pipeline rights-of-way along part of its length.

The probability of affecting cultural resources with this plan is high. Prehistoric to historic sites could be encountered on abandoned levees, cheniers, and buried levees. Three known sites are located along the route of the pipeline.

Plan 2. This alternative would provide for desalinization of gulf water from Bay Des Ilettes. The plant would be located on municipal property adjacent to the existing storage tanks (see Figure 10). The plan would

consist of a 1-MGD-capacity reverse osmosis desalinization plant, an intake structure, and a 12-inch pipeline to connect with the existing distribution system. The first cost of the plan would be $6,200,000, as shown in Table 10. The average annual costs, including operation and maintenance, would be $1,189,000. Average annual benefits would be $682,000.

Sea water obtained from an intake in Bay Des Ilettes would be piped to an inland site on Grand Isle for desalinization. The plant site would require two acres and the pipeline another acre. The plant would be constructed in a developed area and construction impacts should be minor and limited to increased noise, dust, erosion, and some disruption of traffic. The impacts from gases associated with the desalinization process would be small. The effect of the discharge of brine and other associated chemical constituents into the adjacent marine environment is the primary environmental impact of the desalinazation process. Generally, salinity and temperature would increase in the receiving waters near the discharge point. These salinity differences could affect both the flora and fauna of the adjacent receiving waters. Biological investigations on the Florida coast (Clark, Joy, and Rosenthal, 1970) have shown that the effects of the effluent on the area near a discharge can be beneficial or detrimental, depending on the organisms present. Care would be taken to design a plant that would reduce major impacts by diluting and distributing of the discharge. Some organisms would become trapped in the intake system.

No known archeological sites are in the project area. However, there is a low to moderate chance of affecting cultural resources with implementation of the plan.

Plan 3. This alternative would provide for desalinization of the brackish groundwater supplies. The plan would consist of a 1-MGD-capacity reverse osmosis desalinization plant, two wells with piping to the plant, and discharge piping. The plant would be at the same location as in Plan 2

TABLE 10

GRAND ISLE - PLAN 2

Brackish Water Desalinization

Real Estate: 2 acre fee, 1 acre pipeline rights-of-way, 2 acres construction easement	$ 176,000 1/
Desalinization Plant, 1 MGD	3,500,000
Intake structure, 1.56 CFS	300,000
Pipeline, 12"	88,000
Mitigation	25,000
Subtotal	$4,089,000
Contingencies (25%)	1,011,000
Subtotal	$5,100,000
Engineering and Design (11%)	550,000
Supervision and Administration (11%)	550,000
TOTAL - PLAN 2	$6,200,000
Operation and Maintenance	$ 675,000

1/ Includes contingencies

(see Figure 10). The plan would have a first cost of $3,400,000, as shown in Table 11. The average annual costs, including operation and maintenance, would be $682,000. the average annual benefits would be $901,000. The benefit-cost ratio is 1.3 to 1.

The impacts of this alternative on the marine environment would be similar but generally less severe than those noted for Plan 2. The reduction in impacts is a result of the lower saline discharge and the elimination of an open-water intake. The addition of two brackish water wells may have some minor impact on groundwater levels in the area. No known archeological sites are in the project area. However, there is a low to moderate chance of affecting cultural resources with implementation of this plan.

Plan 4. In this alternative, the existing supply would be supplemented by treatment of wastewater for reuse. However, there is no central wastewater collection system on Grand Isle. Accordingly, any plan would have to include a collection system as well as a treatment system. Such a combination of facilities makes the cost prohibitive and the plan infeasible.

The total first cost of the plan, as shown on Table 12, would be $5,740,000 without the cost of a collection system. The average annual cost, including operation and maintenance, would be $776,000.

Plan 5. This alternative consists of using barges and a pushboat to supplement the existing water supply system during periods of heavy demand (see Figure 10). Two barges, each having a capacity of 10,000 barrels, would be required along with a dock facility, a chlorinating and pumping station at the dock, piping from the dock to the existing 1-million-gallon underground storage tank, and rental of a pushboat when the supplemental water is required. The system could supply approximately 300,000 GPD.

TABLE 11

GRAND ISLE - PLAN 3

Brackish Water Desalinization

Real Estate: 2 acre fee	$ 75,000 1/
Desalinization Plant, 1 MGD	2,000,000
Two wells plus pipeline	200,000
Mitigation	15,000
Subtotal	$2,290,000
Contingencies (25%)	510,000
Subtotal	$2,800,000
Engineering and Design (11%)	300,000
Supervision and Administration (11%)	300,000
TOTAL - PLAN 3	$3,400,000
Operation and Maintenance	$ 400,000

1/ Includes contingencies

TABLE 12

GRAND ISLE - PLAN 4

Recycle Wastewater

Real Estate: 1 acre commercial, fee	$ 40,000 1/
Treatment Plant	3,279,000
Pipe connections	450,000
Mitigation, 3 acres	5,000
Subtotal	$3,774,000
Contingencies (25%)	926,000
Subtotal	$4,700,000
Engineering and Design (11%)	520,000
Supervision and Administration (11%)	520,000
TOTAL - PLAN 4	$5,740,000
Operation and Maintenance	$ 300,000

1/ Includes contingencies

The first cost of the plan would be $1,400,000, as shown on Table 13. The average annual costs, including operation and maintenance, would be $258,000. The annual benefits would be $205,000.

The impacts of this alternative would be minor and would be those associated with pipeline placement and construction of a dock and clorinating facilities. Approximately one acre of littoral benthic habitat would be initially disturbed during dock construction and one acre would be affected by the piping. Following construction, benthic species are expected to repopulate. Onshore impacts from the clearing, grubbing, and excavation of marsh required for pipeline placement would be experienced.

Temporary water quality degradation resulting from increased turbidity and increased runoff from construction would occur. Contaminants may enter water bodies through accidental spills of the chlorinating agents. Care would be taken to design and construct the facilities required for this plan so as to minimize environmental impacts. The impact on cultural resources of implementing this plan would be minimal.

Summary of Grand Isle Area Alternatives. Table 14 shows that Plan 5 is the least costly. The annual cost of Plan 1 is the next least costly. However, neither of these plans can supply the needed 1 MGD to satisfy the Grand Isle need. Plan 5 plus Plan 1 will supply the needed 1 MGD, but added together the two plans are no longer the cheapest. Plan 3 becomes the least costly, considering that 1 MGD of water is required. Plan 3 would also have the least impact on the environment. Accordingly, Plan 3 is superior and should be studied in more detail. Plans 1 and 5 should also be carried into more detailed studies.

TABLE 13

GRAND ISLE - PLAN 5

Barge in Fresh Water

Real Estate: 1 acre fee, 1 acre pipeline rights-of-way, 2 acres construction easement	\$ 132,000 1/
Two tank barges, 420,000 gals	672,000
Pipeline, 8"	88,000
Dock and chlorinating facilities	104,000
Pumping station, 0.78 CFS	50,000
Mitigation, 3 acres of wetlands	5,000
Subtotal	\$1,051,000
Contingencies (25%)	249,000
Subtotal	\$1,300,000
Engineering and Design (11%)	50,000 2/
Supervision and Administration (11%)	50,000
TOTAL - PLAN 5	\$1,400,000
Operation and Maintenance	\$ 106,000

1/ Includes contingencies

2/ Applies against items c, d, and e only

TABLE 14

GRAND ISLE ALTERNATIVES

Economic Summary

Alternative		First Cost	Annual Cost
Plan 1	Import from Leeville	$5,200,000	$ 643,000
Plan 2	Seawater desalinization	6,000,000	1,189,000
Plan 3	Brackish water desalinization	3,400,000	682,000
Plan 4	Recycle wastewater	5,740,000	776,000
Plan 5	Barge in fresh water	1,400,000	258,000
Plan 1	Plus Plan 5	6,600,000	901,000

HOUMA AREA

The groundwater in the vicinity of Houma is brackish. The surface water is also brackish during dry periods of prolonged southern winds. Freshwater supplies can be assured by preventing saltwater intrusion, by importing water, or by storing water for use during dry spells. Twelve million gallons a day are required over a 50-day dry period.

Plan 6. This alternative would prevent saltwater intrusion into the Gulf Intracoastal Waterway Houma's raw water supply. The principal source of the intrusion is the Houma Navigation Canal. South winds drive a tide of saltwater up the Houma Navigation Canal to the Gulf Intracoastal Waterway. The alternative consists of a navigable saltwater barrier con-structed across the Houma Navigation Canal near Mile 25 (see Figure 11). The structure would provide a 100-foot-wide, 15-foot-deep navigation opening. The total first cost of this plan would be $14,600,000, as shown on Table 15. The average annual costs, including operation and maintenance, would be $2,010,000.

The Houma Navigation Canal presently acts as a major ingress and egress route between the gulf and the marshes for some of the major estuarine dependent species such as speckled trout, redfish, croaker, blue crab, and shrimp. Physical placement of the structure would change circulation patterns and pose a barrier to biological transport through the Houma Navigation Canal. Impacts on the fishery could be avoided or greatly minimized by designing and operating the barrier to accommodate migratory species. Any bayous that connect the Houma Navigation Canal with the interior marshes that were blocked during canal construction should be reopened to optimize fishery usage of the marshes gulfward of the barrier.

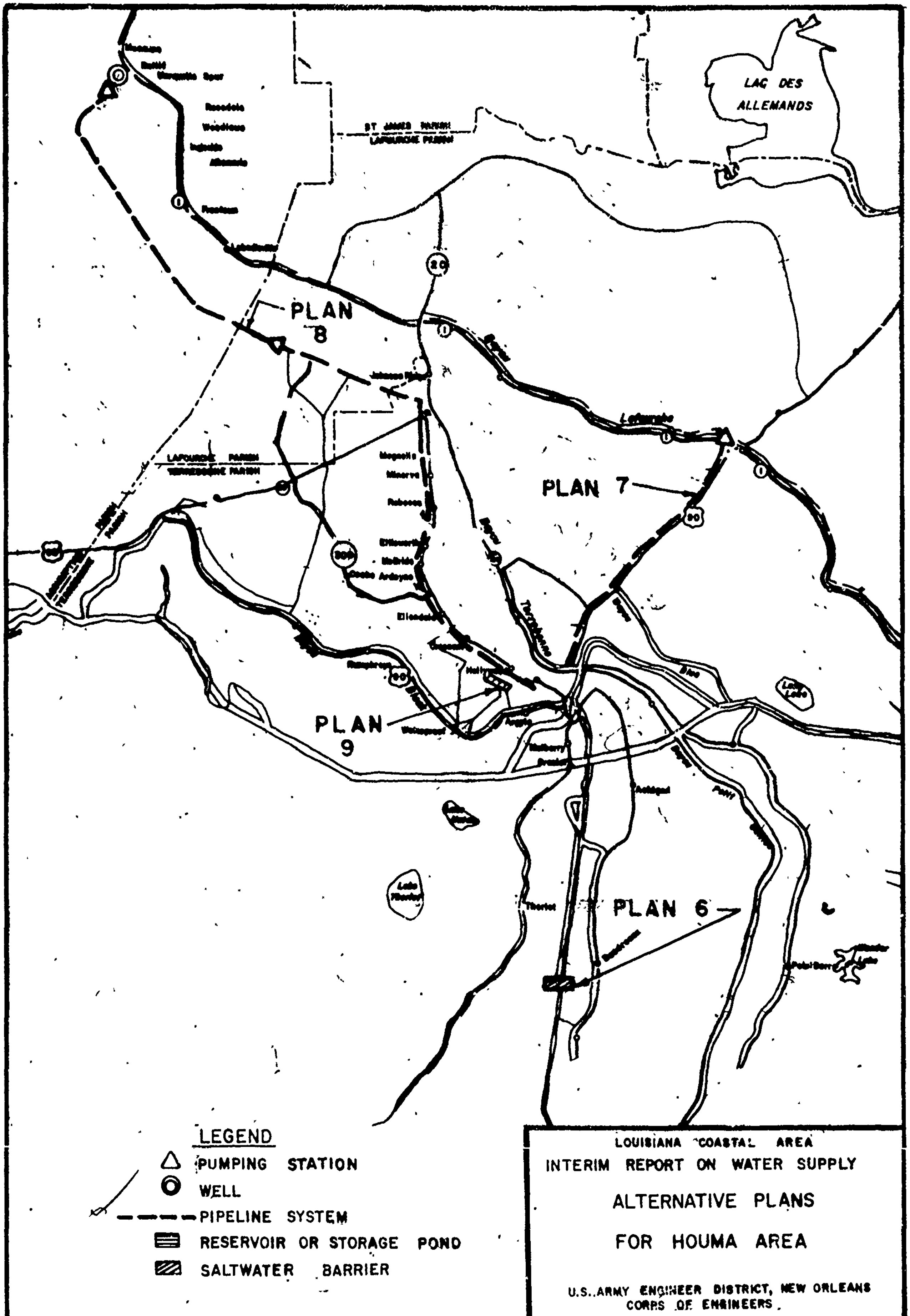

LAC DES ALLEMANDS
ST JAMES PARISH
LAFOURCHE PARISH
PLAN 8
PLAN 7
PLAN 9
PLAN 6
LAFOURCHE PARISH
TERREBONNE PARISH
Lafourche
Terrebonne
Magnolia
Minerva
Rebecca
Ellendale
Thibodaux
LEGEND
PUMPING STATION
WELL
PIPELINE SYSTEM
RESERVOIR OR STORAGE POND
SALTWATER BARRIER
LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS
FOR HOUMA AREA
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 11

TABLE 15

HOUMA AREA - PLAN 6

Saltwater Barrier

Real Estate: 75 acres perpetual rights-of-way	$ 36,000[1/]
Excavation and concrete	4,730,000
Emergency bulkheads	181,000
H-piles and timber guide walks	1,857,000
Sector gates	1,615,000
Sheetpile, cofferdam, clearing, dewatering, and mobilization	980,000
Mitigation	112,000
Subtotal	$9,511,000
Contingencies (25%)	2,489,000
Subtotal	$12,000,000
Engineering and Design (11%)	1,300,000
Supervision and Administration (11%)	1,300,000
TOTAL - PLAN 6	$14,600,000
Operation and Maintenance	$ 800,000

1/ Includes contingencies

Construction of the barrier would severely disturb or eliminate 75 acres of benthic and marsh habitat and the accompanying biota. Sediment would be temporarily released to the water column where it would block light and clog the gills of the fish and invertebrates. Placing a saltwater barrier designed with these considerations in mind, could produce beneficial freshening in the marshes north of the barrier. The prevention of further saltwater intrusion would greatly benefit the wildlife productivity of these marshes. As the marshes north of the barrier become less saline, they would provide supplemental fishing habitat for euryhaline species.

Plan 7. This alternative would provide for importation of fresh water from Bayou Lafourche during periods of saltwater intrusion. The plan would consist of a 17-cfs pumping station to withdraw water from Bayou Lafourche at Raceland and 12 miles of 32-inch pipeline paralleling U.S. Highway 90 to connect with the existing water treatment system of the plant in Houma (see Figure 11). The total first cost of the plan would be $10,400,000 (see Table 16). The annual cost, including operation and maintenance, would be $1,030,000.

Approximately 48 acres would be required for pipeline and pumping station rights-of-way and construction easements. The pipeline alinement would parallel Highway 90 and should use existing service rights-of-way to minimize any impacts on adjacent marshes or water bodies. In the path of the proposed alinement, land use is 8 percent crop and pasture land, 14 percent residential, 33 percent freshwater marsh, 6 percent lake or water bottom, 23 percent commercial service rights-of-way, and 16 percent forested wetlands.

The impacts of pipeline placement include loss of vegetation, poor quality runoff caused by erosion, and the other impacts associated with ditch excavation and backfilling as identified in the impact discussion of the Grand Isle alternatives. The overall terrestrial impacts should be minimal because of the existing roadway rights-of-way.

Construction of the barrier would severely disturb or eliminate 75 acres of benthic and marsh habitat and the accompanying biota. Sediment would be temporarily released to the water column where it would block light and clog the gills of the fish and invertebrates. Placing a saltwater barrier designed with these considerations in mind, could produce beneficial freshening in the marshes north of the barrier. The prevention of further saltwater intrusion would greatly benefit the wildlife productivity of these marshes. As the marshes north of the barrier become less saline, they would provide supplemental fishing habitat for euryhaline species.

Plan 7. This alternative would provide for importation of fresh water from Bayou Lafourche during periods of saltwater intrusion. The plan would consist of a 17-cfs pumping station to withdraw water from Bayou Lafourche at Raceland and 12 miles of 32-inch pipeline paralleling U.S. Highway 90 to connect with the existing water treatment system of the plant in Houma (see Figure 11). The total first cost of the plan would be $10,400,000 (see Table 16). The annual cost, including operation and maintenance, would be $1,030,000.

Approximately 48 acres would be required for pipeline and pumping station rights-of-way and construction easements. The pipeline alinement would parallel Highway 90 and should use existing service rights-of-way to minimize any impacts on adjacent marshes or water bodies. In the path of the proposed alinement, land use is 8 percent crop and pasture land, 14 percent residential, 33 percent freshwater marsh, 6 percent lake or water bottom, 23 percent commercial service rights-of-way, and 16 percent forested wetlands.

The impacts of pipeline placement include loss of vegetation, poor quality runoff caused by erosion, and the other impacts associated with ditch excavation and backfilling as identified in the impact discussion of the Grand Isle alternatives. The overall terrestrial impacts should be minimal because of the existing roadway rights-of-way.

TABLE 16

HOUMA AREA - PLAN 7

Supply from Bayou Lafouche

Real Estate: 1 acre fee, 20 acres perpetual pipeline rights-of-way, 27 acres construction easement	$ 693,000 1/
Pumping Station, intake 17 cfs	278,000
Pipeline	
32" line	4,320,000
32" submerged	1,705,000
Mitigation, 27 acres of marsh	41,000
Subtotal	$7,037,000
Contingencies (25%)	1,563,000
Subtotal	$8,600,000
Engineering and Design (11%)	900,000
Supervision and Administration (11%)	900,000
TOTAL - PLAN 7	$10,400,000
Operation and Maintenance	$ 46,000

1/ Includes contingencies

Subaqueous pipeline crossings would be necessary at Bayou Folse, Hollywood Canal, Bayou Blue, and Bayou Cateau. Impacts would be similar to those described in Plan 1.

There are no endangered species in the area of direct construction impacts. However, an active bald eagle nest is located approximately 3 miles east of Highway 90 near Houma, the closest evidence of endangered species to the construction activity. The birds occupying this nest probably range into the project area for feeding. Precautions would be taken not to disturb the nesting area or food base. It is highly unlikely that construction of this nature would affect the birds, since their nest is located less than a mile from Louisiana Highway 316 southeast of its intersection with Highway 90. Other special features in the area include the probable Indian mounds west of Highway 90 near Raceland. This site is also out of the area of direct impact.

The probability of affecting cultural resources with the plan is moderate to high. Prehistoric to historic sites could be encountered on abandoned levees and buried levees. Two known sites are located along the route of pipeline.

Plan 8. This alternative would provide for importation of groundwater from northern Assumption Parish. Groundwater resources in the Houma area are either brackish or in limited quantities. The plan would include about four deep wells and pumps, two 17-cfs booster pumping stations, and 28 miles of 32-inch pipeline (see Figure 11). The plan would have a total first cost of $21,100,000, as shown in Table 17. The annual cost, including operation and maintenance, would average $1,850,000.

TABLE 17

HOUMA AREA - PLAN 8

Ground Water from Assumption Parish

Real Estate: 3 acres fee, 50 acres perpetual pipeline rights-of-way, 67 acres construction easement	$ 1,048,000 1/
Four deep wells at Napoleonville	625,000
Pumping Stations, 2-booster, 17 CFS	558,000
Pipelines	
32" line	11,010,000
32" submerged	825,000
Mitigation, 2 acres of wetlands	3,000
Subtotal	$14,069,000
Contingencies (25%)	3,231,000
Subtotal	$17,300,000
Engineering and Design (11%)	1,900,000
Supervision and Administration (11%)	1,900,000
TOTAL - PLAN 8	$21,100,000
Operation and Maintenance	$ 97,000

1/ Includes contingencies

At this level of study, neither the numbers or locations of these wells are specified. The impacts associated with well construction are, however, expected to be minor, depending on location and type of habitat affected. A total of 53 acres would be affected as a direct result of construction activity. A large percentage of these impacts will result from the pipeline placement.

Impacts from well and pumping station construction would be minimal. The 50 acres in the area of pipeline construction are approximately 9 percent residential, 17 percent commercial, 70 percent crop and pasturelands, and 4 percent forested wetlands. The only wildlife habitat in the area of pipeline alinement would be the forested wetlands. Because the proposed alinement uses existing highway and pipeline rights-of-way throughout most of its route, impacts on adjacent marshes should be minimal. Impacts of pipeline placement and the subaqueous crossing would be the same as described for Plan 1.

No endangered species are located in the area of direct construction impact. Bald eagles are known to have various nesting sites within the project area. The Hanson Canal nest is approximately 5 miles from the construction area and is the closest to any activity. In addition to wildlife-related impacts, some changes in vegetation may occur near the well sites because of lowered groundwater level. If the aquifer level is lowered significantly, freshwater intrusion from more upland sources could trigger vegetation changes and reductions in groundwater at the more upland locations.

There are no known archeological sites along the route of the proposed pipeline. There is a low to moderate chance of affecting cultural resources with plan implementation.

<u>Plan 9</u>. In this alternative, fresh water would be stored for use during periods of saltwater intrusion. An existing pond would be used to store fresh water taken from the Gulf Intracoastal Waterway during the period when the water is within an acceptable salinity range (see Figure 11). During periods of high salinity in the GIWW, the water in the pond would be used as a raw-water supply. The pond, which is relatively close to the City of Houma, was previously used in operation of the Southdown Sugar mill and complete cleanup and reconstruction of the interior would be required. The 200-acre pond is approximately 8 feet deep. A depth of 9 feet would be required to provide storage capacity for a 50-day freshwater supply at a rate of 12.0 million gallons per day. The required cleaning operations would provide the necessary depth. Because of the nature of the prior use, a lining may be required to prevent contamination of the stored water. Soil tests will be necessary to determine if a lining is required.

The plan consists of pond renovation, two 17-cfs pumping stations, and 3 miles of 32-inch cast-iron pipe. Assuming a lining is required, the total first cost of the plan would be $21,300,000, as shown in Table 18. The average annual cost, including operation and maintenance would be $1,930,000.

However, if lining the pond is not a requirement, the total first cost of the plan would be $7,100,000. The average annual cost, including operation and maintenance, would be $754,000.

Implementing this plan should cause minimal environmental impacts. Approximately 15 acres of rights-of-way are needed for pipeline placement and the pumping station. Of this acreage, approximately eight acres would be directly affected by excavation and backfilling operations. The remainder would be used as construction and maintenance access. The pipeline

TABLE 18

HOUMA AREA - PLAN 9

Storage Reservior

Real Estate: 201 acres fee, 6 acres perpetual rights-of-way for pipelines, 14 acres construction easements for reservoir and pipelines	$ 233,000 1/
Clearing reservoir	2,856,000
Lining reservoir	9,322,000 2/
Intake structure and booster pump, 17 CFS	279,000
Pipelines	
30" line	300,000
32" line	1,054,000
Mitigation, 6 acres of wetlands	9,000
Subtotal	$14,053,000
Contingencies (25%)	3,447,000
Subtotal	$17,500,000
Engineering and Design (11%)	1,900,000
Supervision and Administration (11%)	1,900,000
TOTAL - PLAN 9	$21,300,000
Operation and Maintenance	$ 165,000

1/ Includes contingencies

2/ The reservoir was used previously to store wastewater from the sugar mill. A lining may not be necessary; however, the reservoir soils should be tested. If a lining is not required the first cost for Plan 12 would be reduced to $7,100,000.

would cross crop and pastureland for most of its length. Impacts on the marsh would be only minimal and would be primarily runoff from the newly excavated rights-of-way that parallel the marsh.

An additional six acres of marsh may be affected during decontamination of the pond site. This would be caused by placing the dredged material from the pond in or near the shore/marsh interface. Depending on the contaminants found in the material, the marsh may or may not be affected in the long term. If the natural elevation is maintained in the marsh, few impacts on the marsh are expected.

No archeological sites exist in the project area. There is, however, a low possibility that cultural resources will be affected along the backslope of the abandoned levees in the area.

Summary of Houma Area Alternatives. Table 19 shows that Plan 7 is the least costly. However, final plan selection may very well depend on whether a protective reservoir liner is required with Plan 9. If a liner is required, the cost of Plan 9 would be prohibitive and Plan 7 would then be the least costly. If a liner is not required, Plan 9 would be the least costly. The environmental impacts of both Plans 7 and 9 are minor. Plan 6, although costly, has a great deal of support from fish and wildlife agencies and local residents. The barrier, by controlling saltwater intrusion, would benefit fish and wildlife resources and would reduce land loss in additon to protecting the water supplies of Houma. Plans 6, 7, and 9 should be retained for more detailed studies.

PLAQUEMINES PARISH

The residents of Plaquemines Parish are concerned about saltwater intrusion into their public water supply system. Salinities exceeding U.S. Environmental Protection Agency standards for public water supply occur

TABLE 19

HOUMA AREA ALTERNATIVES

Economic Summary

Alternative		First Cost	Annual Cost
Plan 6	Saltwater barrier	$14,600,000	$2,010,000
Plan 7	Supply from Bayou Lafourche	10,400,000	1,030,000
Plan 8	Groundwater from Assumption Parish	21,100,000	1,850,000
Plan 9	Storage in reservoir	21,300,00.0 1/	1,930,000 1/

1/ If a reservoir liner is not needed to prevent contamination, the first cost of Plan 9 would be $7,100,000 and the annual cost $754,000.

annually at the Boothville-Venice waterworks (mile 18.6). Present practice is to mix stored fresh water with the brackish water supply to obtain potable water. However, with the projected increased water usage, supplemental supplies will be needed in the future since both ground and surface supplies are brackish. Available solutions include importation of water supplies or storage. The alternative plans below were designed to supply 5.3 MGD over a period of 60 days.

Plan 10. This alternative would consist of a raw water intake in the Mississippi River at mile 116.0 and transportation of raw water via pipeline to the existing treatment plants at East and West Pointe-a-la-Hache (see Figure 12). The intake at mile 116.0 is considered far enough upstream to be protected from saltwater intrusion. The plan includes an intake, an 8.2-cfs booster pump, and 42.9 miles of 8- to 24-inch diameter pipeline. The total first cost of the plan would be $30,200,000, as shown on Table 20. The average annual cost, including operation and maintenance, would be $2,540,000.

Approximately 75 acres would be required for pipeline construction and an additional 100 acres for construction access. The 25-acre area that would incur direct construction impacts includes forested and nonforested wetlands, crop and pastureland, and industrial lands. The impacts of pipeline placement and the subaqueous crossings (Cousins, Line, and Algiers Canals and the Mississippi River) are as described in Plan 1. There are no endangered species in the area of direct impact. No known archeological sites are in the project area. However, there is a high possibility that the pipeline would affect cultural resources along the section paralleling the Mississippi River levee.

Plan 11. This alternative consists of drilling wells into underground saltwater aquifers and pumping fresh water into the aquifers for storage and recovery for use when needed (see Figure 12). The required storage

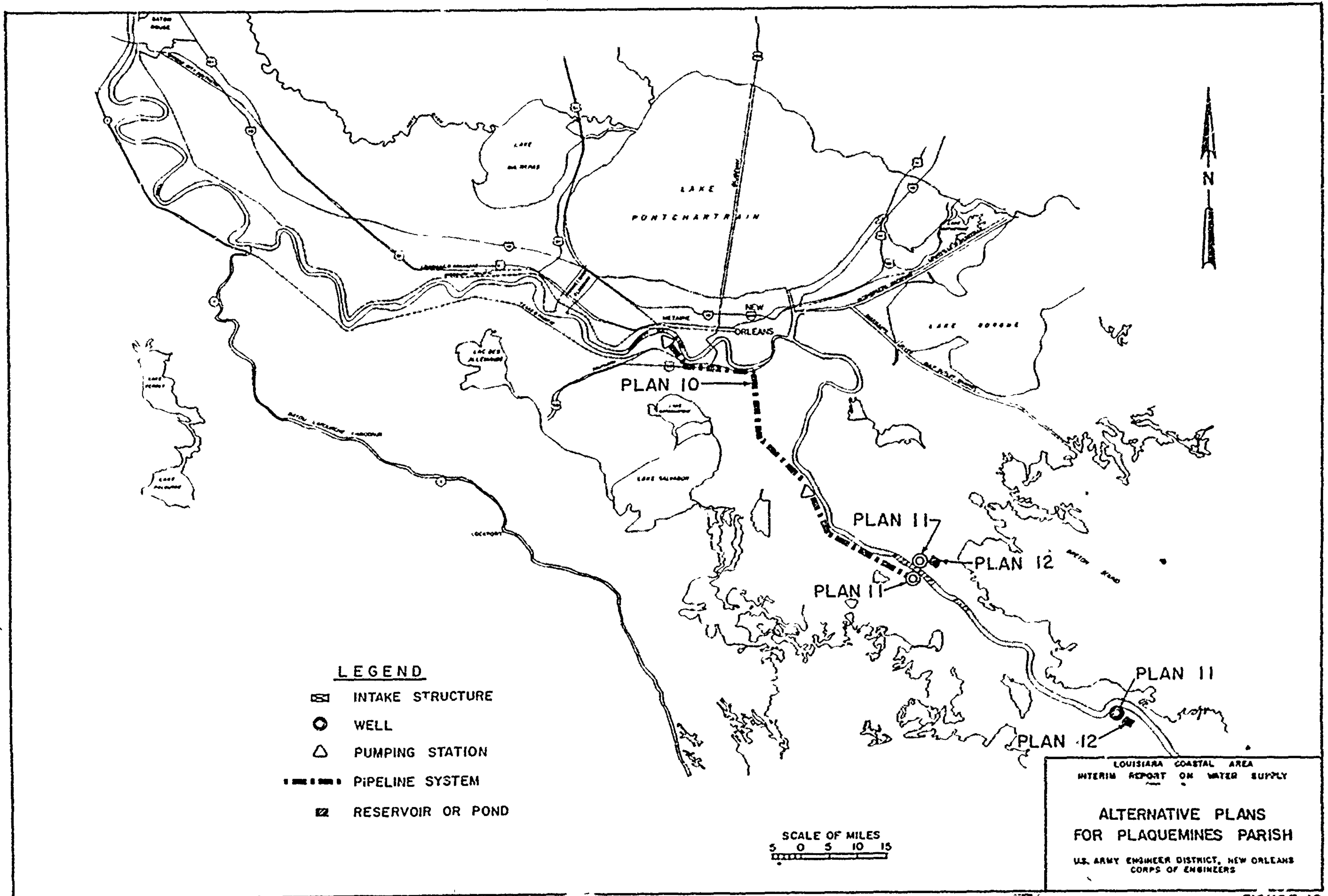


FIGURE 12

FIGURE 12

TABLE 20

PLAQUEMINES PARISH - PLAN 10

Import Raw Water from Intake in Mississippi River at Upstream Location

Real Estate	$ 3,580,000[1]
Pumping Stations	
Intake, 8.2 cfs	187,000
Booster, 8.2 cfs	150,000
Pipelines	
8" submerged crossing	1,000,000
24" line	14,400,000
24" submerged crossing (Algiers, Cousins and Line Canals)	1,250,000
Mitigation, 6 acres of marsh	10,000
Subtotal	$20,577,000
Contingencies (25%)	4,223,000
Subtotal	$24,800,000
Engineering and Design (11%)	2,700,000
Supervision and Administration (11%)	2,700,000
TOTAL - PLAN 10	$30,200,000
Operation and Maintenance	$ 40,000

1/ Includes contingencies

would be 5.3 MGD for 60 days or a total of 318 million gallons. The water must be treated before storing to avoid contaminating the aquifer. This is new and unproven technology and no reliable design and cost data are available. A demonstration project started for the Houma area was designed to provide a 50-day supply of fresh water at a rate of 2 MGD (100 million gallons total). The estimated cost of the project was about $1,000,000. However, before the project was complete, the funding was cut. Suitable aquifers in Plaquemines Parish are deeper and more highly compacted. Drilling wells would be very costly.

Certain geologic conditions must prevail in order to store fresh water in aquifers. The aquifers must be uniform, extensive, horizontally level (not dipping) confined above and below, and located relatively close to the ground surface, and have a low natural permeability flow rate. Practically none of these conditions exist in the saltwater aquifer south of Lake Pontchartrain. In Plaquemines Parish, the deltaic sediments are complexly interrelated. Hydraulic connection, lateral and vertical, exists between the aquifers, causing migration and dispersive mixing with saline water. In addition, aquifers in the area dip approximately 10 feet per mile. Because of the different densities of fresh water and saltwater, the fresh water would tend to migrate up the dip. The geologic conditions in the project area are such that the plan to store water in underground aquifers is not feasible.

Based on adapting the Houma studies to the conditions in Plaquemines Parish, 19 wells would be needed: 2 at East Pointe-a-la-Hache, 10 at West Point-a-la-Hache, and 7 at Boothville. The total first cost of the plan would be $8,100,000, as shown on Table 21.

TABLE 21

PLAQUEMINES PARISH - PLAN 11

Store Water in Underground Aquifers

Real Estate	$ 202,000[1/]
Deep Wells: 19 (2 @ East Pointe-a-la-Hache, 10 @ West Pointe-a-la-Hache, and 7 @ Boothville)	5,130,000
Mitigation	30,000
Subtotal	$5,362,000
Contingencies (25%)	1,338,000
Subtotal	$6,700,000
Engineering and Design (11%)	700,000
Supervision and Administration (11%)	700,000
TOTAL - PLAN 11	$8,100,000
Operation and Maintenance	$ 86,000

1/ Includes contingencies

Placement of these wells would require approximately 19 acres of land. The proposed well sites are all to be located on upland developed sites. Therefore, their construction would have minimal impact on wildlife or habitat.

Other environmental concerns associated with this alternative are related to the impact on local water quality and water usage. During times of heavy water use, saltwater intrusion could threaten the wellwater source and could contaminate the water stored in the aquifer. The increased number of wells in the area may also lower other local groundwater sources and possibly alter usage patterns. During times of heavy pumpage, induced saltwater intrusion may also occur, causing a reallocation of groundwater levels and further altering already established wells.

While there are few terrestrial wildlife impacts associated with this alternative, the potential problems inherent in underground storage could be significant. The possibility of affecting cultural resources in the area is very low with this plan.

Plan 12. This alternative consists of providing earthen reservoirs adjacent to the water treatment plants to store untreated fresh water (see Figure 12). On the east bank, one reservoir with the capacity of 36 million gallons would be required adjacent to the East Pointe-a-la-Hache water treatment plant. On the west bank, storage of 282 million gallons would be required for the West Pointe-a-la-Hache and Boothville water treatment plants. Since the greatest need will be at Boothville and the plants are connected, one reservoir containing the entire 282 million gallons would be placed adjacent to the Boothville water treatment plant.

The total first cost of the plan would be $8,900,000, as shown on Table 22. The average annual cost, including operation and maintenance, would be $778,000.

TABLE 22

PLAQUEMINES PARISH - PLAN 12

Store Water in Open Reservoirs

Real Estate: 2 acres fee, 2 acres perpetual pipeline easement, 104 acres perpetual levee easement, 26 acres perpetual reservoir easement, and 2 acres construction easement	$ 83,000 1/
Embankment	
East Pointe-a-la-Hache	1,350,000
Boothville-Venice	2,800,000
Pumps and Piping	
East Pointe-a-la-Hache	350,000
Boothville-Venice	1,200,000
Mitigation, 31 acres of brackish marsh	47,000
Subtotal	$5,830,000
Contingencies (25%)	1,470,000
Subtotal	$7,300,000
Engineering and Design (11%)	800,000
Supervision and Administration (11%)	800,000
TOTAL - PLAN 12	$8,900,000
Operation and Maintenance	$ 40,000

1/ Includes contingencies

The construction of the East Pointe-a-la-Hache reservoir would affect approximately 31 acres of brackish marsh, 25 of which would be permanently lost through levee placement and pumping station construction. Twelve acres would be permanently submerged by the reservoir and lost as marsh. Temporary increases in siltation and turbidity would occur in adjacent waterways and marshes during levee construction. The reservoir would limit tidal exchange and alter flow patterns across this portion of the marsh.

The Boothville reservoir and associated pipeline, levees, and pumping stations would require approximately 103 acres of land. The proposed reservoir site is in a ponding area for the New Orleans-to-Venice hurricane protection levee. This area is expected to return to marsh in 5-15 years. The impacts associated with this plan would be loss of future marsh, increased turbidity, siltation, and runoff in the adjacent marshes and water bodies. The levees would be built from cast clay fill assumed to come from adjacent canals and waterways. While more benthic habitat may be affected through direct removal in the dragline casting operation, the long-term effect is not expected to be severe due to repopulation from surrounding benthic communities. The existing benthic communities in these channels are probably of lesser value than communities found in the unaltered environments in the surrounding marshes and water bodies.

There are no endangered species in the area of direct impact. The possibility that this plan would adversely affect cultural resources in the area is very low.

Summary of Plaquemines Parish Alternatives. Plan 12 is the least costly of the feasible plans (see Table 23). The environmental impacts of Plan 12 are not severe although some marsh may be lost. Plan 10 is very costly while its environmental impacts are comparable to Plan 12. Plan 11 has the lowest first cost, but is not feasible because of unfavorable geologic conditions. Plan 12 and other open storage plans should be studied in more detailed studies.

TABLE 23

PLAQUEMINES PARISH ALTERNATIVES

Economic Summary

Alternative		First Cost	Annual Cost
Plan 10	Import Mississippi River water from upstream	$30,200,000	$2,540,000
Plan 11	Store water in underground aquifer	8,100,000	1/
Plan 12	Store water in open reservoir	8,900,000	778,000

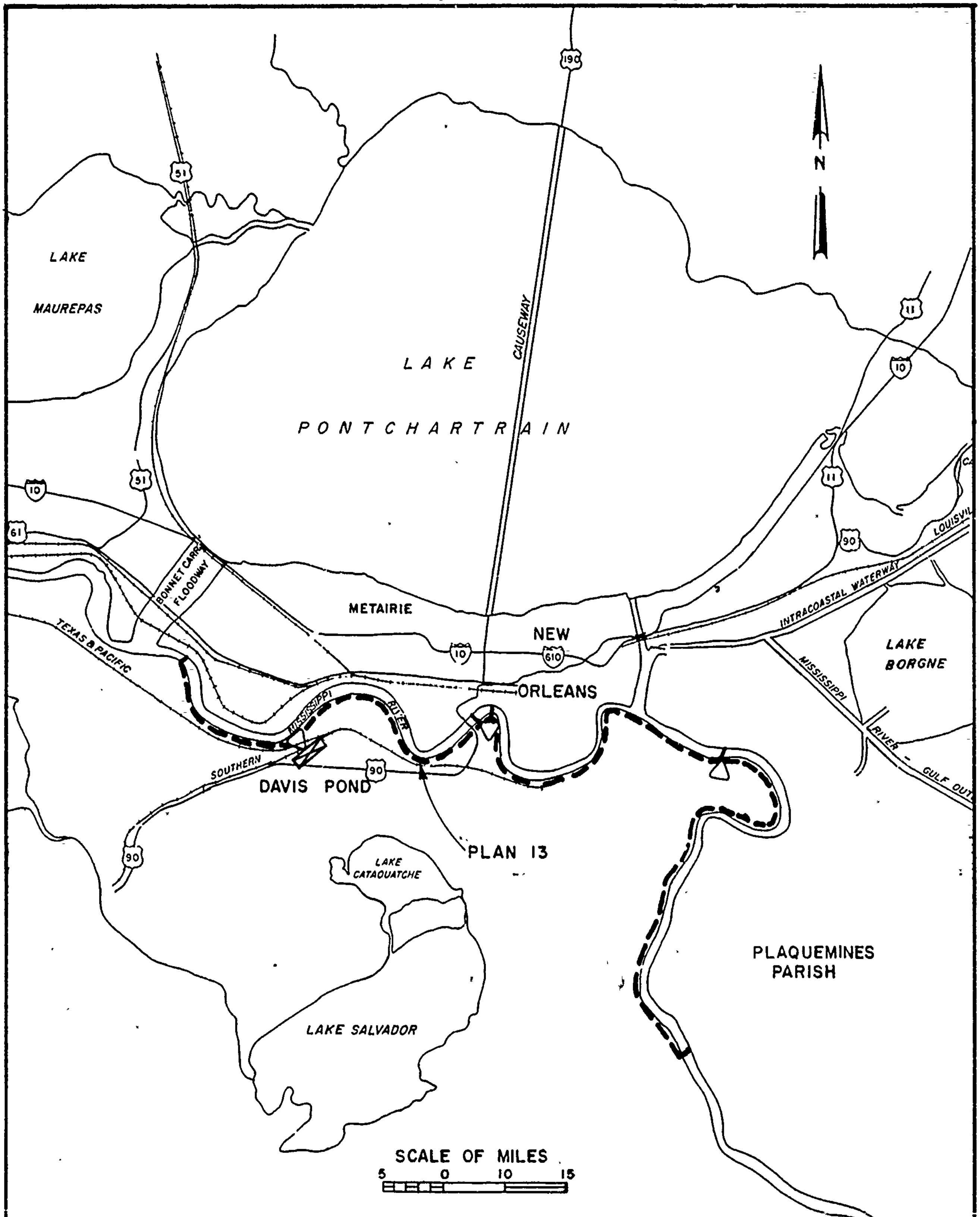
1/ Plan not feasible. Annual cost not computed.

RIVER PARISHES

Groundwater is available in the River Parishes only at isolated locations. Therefore, if the surface supply were polluted in an emergency and not useable, communities in this area could either import alternative supplies or use water that had been stored in some prearranged locations. About 200 MGD would be needed to supply the River Parishes for a 15-day emergency period. Several water supply alternatives were investigated. While these alternatives were designed to supply the required flow for 15 days, each could be used year-round.

Plan 13. This alternative provides for storage of Mississippi River water at the proposed Davis Pond freshwater diversion site at mile 118 on the west bank of the Mississippi River (see Figure 13). The facility is designed to divert a maximum Mississippi River flow of 10,650 cfs to the Barataria Basin from Jaunuary through May. The overflow area is 7,425 acres with guide levees on each side. With this alternative, the overflow area would be modified so that it could also be used for storing water. The guide levees would be raised and a levee would be constructed across the lower portion of the basin. The water level in the overflow area would be raised 1 1/4 feet to provide the needed storage. In time of emergency, diversion would be stopped and the overflow area would become a storage reservoir. The stored water would be distributed to the River Parishes through a system of 3 pumping stations and 43 miles of pipeline varying in diameter from 20 to 87 inches. The total first cost for the plan would be \$73,300,000 (see Table 24). The average annual cost, including operation and maintenance, would be \$6,320,000.

In the impact analysis, the freshwater diversion plan is assumed to be in place as designed, and the impacts of this alternative are estimated on the modification to the existing design.



LEGEND

- △ PUMPING STATION
- ⊠ INTAKE STRUCTURE
- — — PIPELINE SYSTEM

LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR RIVER PARISHES

STORAGE OF FRESHWATER
FROM MISSISSIPPI RIVER
AT DAVIS POND DIVERSION SITE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 13

TABLE 24

RIVER PARISHES - PLAN 13

Storage at Davis Pond

Real Estate: 2 acres fee, 115 acres pipeline rights-of-way, 150 acres construction easement	$ 7,151,000 1/
Pumping Stations	
Intake, 309 cfs	$ 1,198,000
Booster, 121 cfs	579,000
Booster, 7 cfs	141,000
Levee and Weir	3,000,000
Pipelines	
20" line	1,045,000
20" submerged	2,500,000
22" line	416,000
28" line	1,368,000
30" submerged	2,750,000
36" submerged	4,950,000
38" line	4,722,000
38" submerged	1,375,000
60" line	2,534,000
72" line	331,000
87" line	9,034,000
Mitigation, 7,400 acres of wetlands	6,400,000
Subtotal	$49,494,000
Contingencies (25%)	10,606,000
Subtotal	$60,100,000
Engineering and Design (11%)	6,600,000
Supervision and Administration (11%)	6,600,000
TOTAL - PLAN 13	$73,300,000
Operation and Maintenance	$ 242,000

1/ Includes contingencies

The major impacts would result from levee placement, pipeline construction, and modification of the hydrologic regime. With the existing freshwater diversion project, the marsh would not have been permanently flooded and would remain viable. Under this plan, 2 1/2 feet of water would be stored continuously and the marsh would be submerged. Portions of this marsh acreage are in the highly productive fur and waterfowl habitat of the Salvador State Wildlife Management Area. The productivity of this marsh would be lost. Some freshwater fish production could be expected in the newly created reservoir. However, due to steep shorelines and lack of cover, this would not be considered prime nursery or spawning area. The number of waterfowl using the overflow area would be reduced because of the deeper water and concurrent loss of submerged shallow water vegetation. The construction of approximately three miles of new levee and weir systems across the southernmost portions of the Davis Pond site overflow area would be required to create the water supply reservoir. The direct construction impact is resulting from levee placement would be on approximately 19 acres. Construction activities associated with levee building would tend to increase local turbidities and create linear canals that, in turn, could result in degraded water quality and cause increased marsh erosion. In addition to these impacts, the levees themselves would modify the vegetation pattern of the marsh and result in less productive scrub-shrub habitat. During levee construction, runoff associated with placement of dredged material could result in release of toxic organic compounds, pesticides, heavy metals, and hydrogen sulfite, creating increased oxygen demand.

Other impacts are a result of modifying the hydrologic regime within the Davis Pond area through reservoir creation. The levee system required for retention of the emergency water supply would eliminate the free hydrologic interchange between Lake Cataouatche and the overflow area and limit the productive contribution of the overflow area to the lake. A combination of the deep water habitat created by the reservoir and the reduction in marsh

flooding from Lake Cataouatche would limit the contribution of the adjacent marsh fishery to Lake Cataouatche. There are no endangered or threatened species in the line of direct impact. There are 10 bald eagle nests in the study area, one in the vicinity of Davis Pond, but no nests would be affected by the construction. However, the effect of the plan on the eagle feeding area must be determined. It is possible that consulta-tion with the U.S. Fish and Wildlife Service would be required under the Endangered Species Act.

Additional impacts would also occur from construction of the pipeline distribution system and associated pumping stations. The pipeline alinement would use the previously existing rights-of-way and commercial service access adjacent to the Mississippi River levee.

The pipeline and pumping stations would require approximately 117 acres of land, the majority made up of commercial and service access along with industrial rights-of-way and agricultural or pasture lands. The impacts would involve temporary disturbance of some residential, commercial, and agricultural areas.

Five subaqueous crossings would be constructed as part of the distribution pipeline: four crossing the Mississippi River and one crossing the Intracoastal Waterway. Impacts would be similar to those described in Plan 1.

Bayou Segnette State Park, Jean Lafitte National Historical Park, and Salvador Wildlife Management Area are in the study area but would not be directly affected by the construction. However, some indirect impacts may be expected.

Numerous historic sites are located along the Mississippi River levees. A high possibility exists that cultural resources would be affected with implementation of this plan.

The loss of 7,425 acres of marsh as a result of impoundment, the modification of the bald eagle feeding area, and the reduction in productivity of a wildlife management area make this plan objectionable from an environmental viewpoint.

Plan 14. This alternative would provide for a storage area similar to Plan 13. However, the site to be modified would be Big Mar (Caernarvon) on the east bank of the Mississippi River at mile 81.0 (see Figure 14). In the plan, impounding levees would be constructed around the Big Mar reservoir to store the required 9,200 acre-feet of water needed during the emergency. The plan would also include 3 pumping stations and 59.6 miles of 20- to 80-inch diameter pipeline. The plan would have a total first cost of $95,800,000 as shown on Table 25. The average annual cost, including operations and maintenance, would be $8,190,000.

The impact analysis is based on the Big Mar freshwater diversion plan being in place. Therefore, the major impacts are associated with the conversion of a productive shallow water habitat to an impounded deepwater habitat. The productivity of this site would be greatly reduced by the impounding levees because Big Mar would be isolated from its nutrient and detrital input. The Big Mar site is approximately 2,600 acres, but an estimated 9,200 acre-feet of water supply is needed. Thus, the needed reservoir acreage must be obtained by building levees of sufficient height. Approximately 150 acres of fresh marsh would be lost because of levee construction. Terminating the interchange between Big Mar and its adjacent marsh could significantly affect the contribution of this area to the fishery in Lake Lery. At the very least, a much reduced contribution of larval aquatic organisms would be available to the Lake Lery system.

Approximately 117 acres are required for the water supply pipeline distribution system and the associated pumping stations. Impacts would be minimized because the pipelines would follow existing routes and land

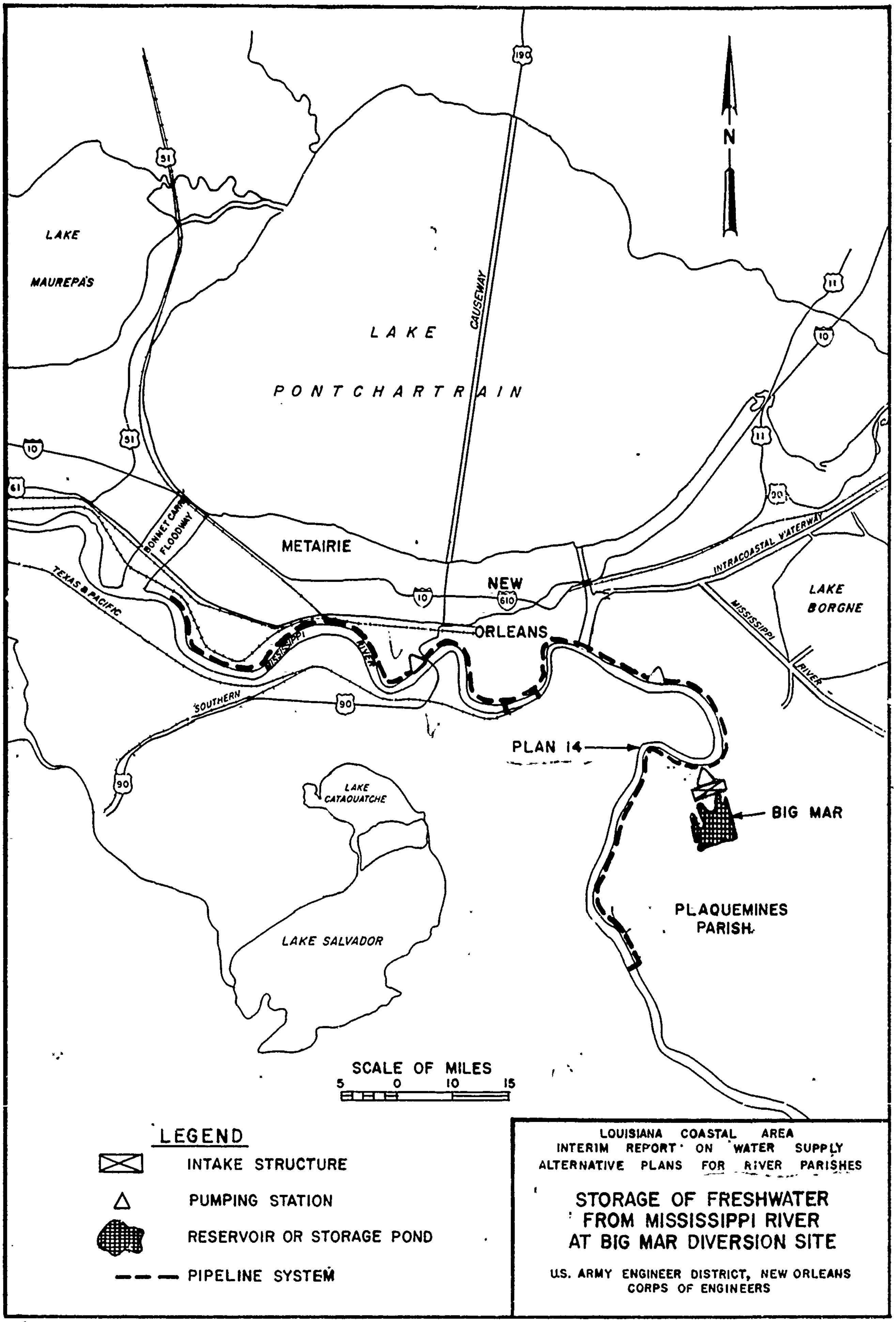

N
LAKE
MAUREPAS
LAKE
PONTCHARTRAIN
CAUSEWAY
190
51
51
10
61
10
11
11
10
90
BONNET CARRE FLOODWAY
METAIRIE
NEW
ORLEANS
10
610
INTRACOASTAL WATERWAY
LAKE
BORGNE
MISSISSIPPI
RIVER
TEXAS & PACIFIC
MISSISSIPPI
RIVER
SOUTHERN
90
90
PLAN 14
BIG MAR
LAKE
CATAOUATCHE
LAKE SALVADOR
PLAQUEMINES
PARISH
SCALE OF MILES
5 0 10 15
LEGEND
INTAKE STRUCTURE
PUMPING STATION
RESERVOIR OR STORAGE POND
PIPELINE SYSTEM
LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR RIVER PARISHES
STORAGE OF FRESHWATER
FROM MISSISSIPPI RIVER
AT BIG MAR DIVERSION SITE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 14

TABLE 25

RIVER PARISHES - PLAN 14

Storage at Bi., Mar

Real Estate: 2 acres fee, 115 acres pipeline rights-of-way, 150 acres construction easement	$24,060,000 1/
Pumping Station:	
Intake, 309 cfs and levees	$ 1,198,000
Booster, 280 cfs	898,000
Booster, 14 cfs	279,000
Levee and Reservoir Preparation	10,000,000
Pipelines	
20" line	783,000
22" submerged	1,750,000
22" submerged	2,000,000
24" line	5,044,000
24" submerged	2,000,000
30" line	5,468,000
36" submerged	1,925,000
48" line	340,000
72" line	3,300,000
80" line	7,490,000
80" line	975,000
Mitigation, 150 acres of marsh	225,000
Subtotal	$67,735,000
Contingencies (25%)	10,865,000
Subtotal	$78,600,000
Engineering and Design (11%)	8,600,000
Supervision and Administration (11%)	8,600,000
TOTAL - PLAN 14	$95,800,000
Operation and Maintenance	$ 248,000

1/ Includes contingencies

uses, as described under Plan 13. The primary impacts associated with the pipeline distribution system would be those related to subaqueous crossings, as described in Plan 1. Five subaqueous pipeline crossings are associated with this alternative: four crossings on the Mississippi River (Luling, Marrero, Harvey, and Belair) and one at the Intracoastal Waterway.

No endangered species are in the area of direct construction impact. However, nesting bald eagles are present in the study area. The closest site is on the northwest shore of Lake Salvador and the other near Lafitte, Louisiana. Neither site would be affected by the construction. This plan would be more acceptable from an environmental viewpoint than Plan 13. The chance that cultural resources would be affected by this plan is the same as for Plan 13.

Plan 15. This alternative would provide for use of Lake Maurepas as a supply source and a system of pumps and piping for distribution of water to the River Parishes (see Figure 15). A navigable saltwater barrier would be constructed in Pass Manchac between Lakes Maurepas and Pontchartrain to prevent saltwater intrusion from Lake Pontchartrain. The plan would consist of a navigable saltwater barrier, an intake pump, and 3 booster pumps ranging in capacity from 9 to 309 cfs, and 86 miles of 22- to 87-inch diameter pipeline. The plan would have a total first cost of $146,000,000 as shown on Table 26. The average annual cost, including operation and maintenance, would be $12,500,000.

Approximately 177 acres of land would be subject to direct construction impacts and an additional 210 acres would be used for construction access. The pipeline rights-of-way would have minimal environmental impact on wildlife habitat due to the maximum use of existing commercial and service rights-of-way. The land use along the pipeline alinement is essentially the same as that described in Plan 13. However, for an

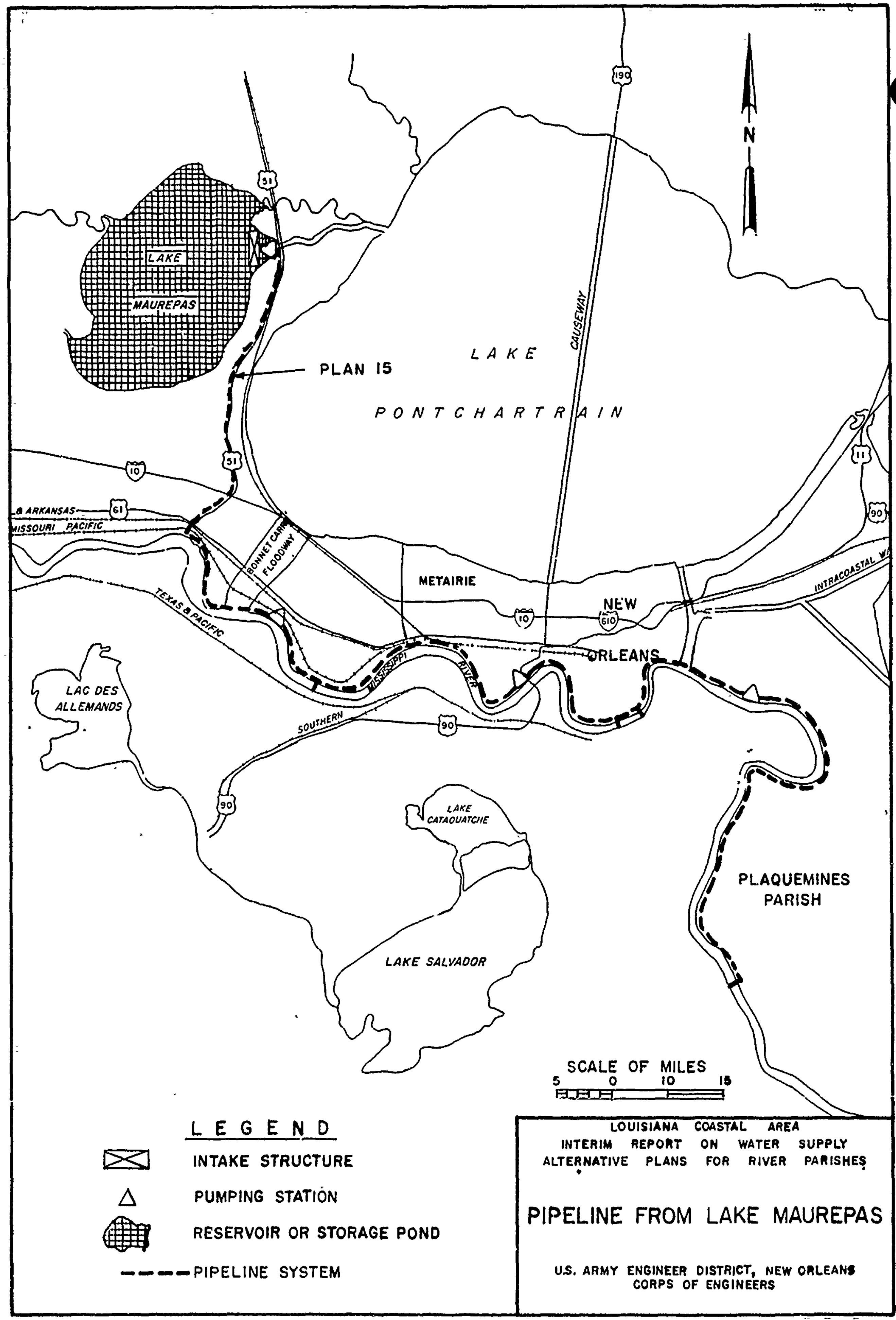

LAKE MAUREPAS
PLAN 15
LAKE PONTCHARTRAIN
CAUSEWAY
190
51
10
61
& ARKANSAS
MISSOURI PACIFIC
BONNET CARRE FLOODWAY
METAIRIE
NEW ORLEANS
610
INTRACOASTAL W
11
90
TEXAS & PACIFIC
MISSISSIPPI RIVER
LAC DES ALLEMANDS
SOUTHERN
LAKE CATAOUATCHE
LAKE SALVADOR
PLAQUEMINES PARISH
SCALE OF MILES
5 0 10 15
LEGEND
INTAKE STRUCTURE
PUMPING STATION
RESERVOIR OR STORAGE POND
PIPELINE SYSTEM
LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR RIVER PARISHES
PIPELINE FROM LAKE MAUREPAS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 15

TABLE 26

RIVER PARISHES - PLAN 15

Supply from Lake Maurepas

Real Estate: 2 acres fee, 175 acres pipeline rights-of-way, 210 acres construction easement	$ 25,161,000 [1/]
Pumping Stations	
Intake, 309 cfs	$ 1,198,000
Booster, 304 cfs	998,000
Booster, 214 cfs	898,000
Booster, 7 cfs	141,000
Saltwater Barrier	14,416,000
Pipelines	
22" submerged	3,750,000
24" line	7,891,000
24" submerged	2,000,000
36" line	3,825,000
36" submerged	2,750,000
38" line	723,000
60" line	2,534,000
72" line	463,000
84" line	13.558,000
87" line	20,141,000
Mitigation, blockage of migratory route	200,000
Subtotal	$100,647,000
Contingencies (25%)	18,853,000
Subtotal	$119,500,000
Engineering and Design (11%)	13,200,000
Supervision and Administration (11%)	13,300,000
TOTAL - PLAN 15	$146,000,000
Operation and Maintenance	$ 343,000

1/ Includes contingencies

estimated 15 miles, the pipeline would be in the Highway 51 rights-of-way that are adjacent to some very productive forested wetland and marsh. The impacts of pipeline and crossing construction are similar to those described in Plan 1.

No endangered species would be directly affected by the construction. However, bald eagle nesting sites are in the project area. The Moisant and Maurepas eagle nests are adjacent to portions of the alinement. The Maurepas nesting site would be the closest (approximately 8 miles) to any construction activity.

Placement of the saltwater barrier would result in the removal or burial of benthic habitat, increased turbidity, and increased oxygen demand. The degree and periodicity of these impacts would depend on the size and design of the sill structure. Concentrations of speckled trout and catfish are found immediately adjacent to the shoreline of Lake Pontchartrain at the entrance of Pass Manchac. Construction activities could affect the feeding and spawning activity in this area, depending on time and period of construction. In addition, this pass is used as a spawning habitat for both marine and estuarine dependent species. The placement and operation of the saltwater barrier could alter water flow and result in reduced nutrient and detrital exchange between Lake Pontchartrain and Maurepas. Rough estimates indicate that the barrier-caused salinity changes in Lakes Pontchartrain and Maurepaus would not be sufficient to be detrimental to the fishery presently in the lakes. Some displacment and redistribution of organisms may occur. [illegible] all the impacts noted above are probable due to the placement of the sa[illegible]er barrier, most of these effects could be eliminated or greatly reduced by proper design. The distribution pipeline is similar to that of Plan 13 and the impact on cultural resources would also be similar.

Plan 16. This alternative would provide for the withdrawal of Mississippi River water above the most probable points of contamination (see Figure 16). From the withdrawal point, the water would be transported via

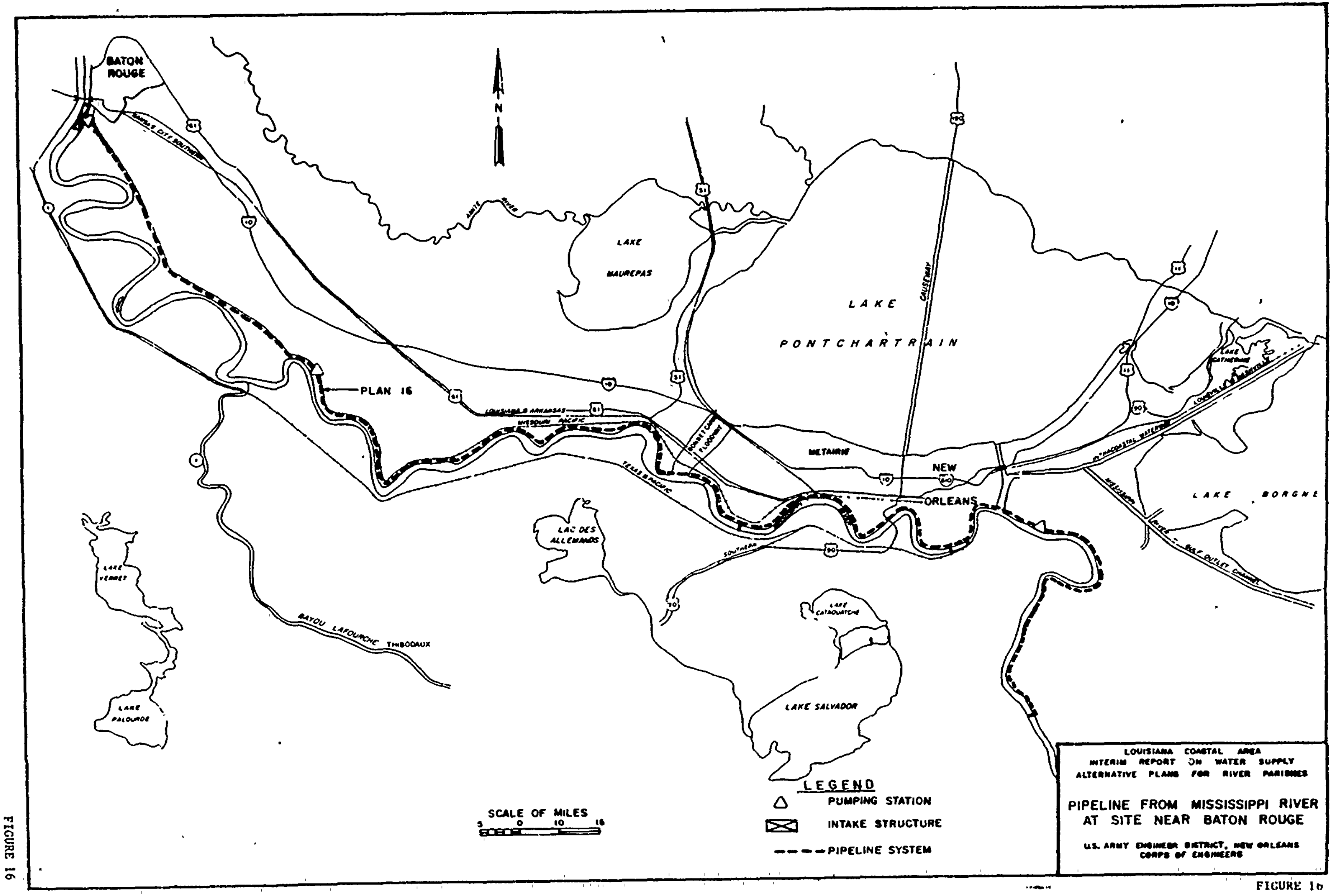


FIGURE 16

FIGURE 16

pipeline to communities along the Mississippi where emergency supplies were needed. The point selected for withdrawal is at mile 225 just below the Baton Rouge city limits. The plan would consist of an intake pump and 5 booster pumps varying in capacity from 7 cfs and 309 cfs. The piping would extend 127 miles and would vary in diameter from 22 to 30 inches. The plan would have a total first cost of $177,000,000, as shown on Table 27. The average annual cost, including operation and maintenance would be $15,100,000. Environmental and cultural resource impacts associated with the pipeline construction would be essentially the same as those in Plan 1.

A total of 263 acres is required for construction of this alinement and the associated pumping stations. These 263 acres make up a variety of land uses, mainly agricultural, commercial, and residental. Some forest would be affected because of the clearing and burning operations.

While the rights-of way may segment some forest habitats, they could also provide corridors of movement for other forest species as well as create an "edge" effect. The rights-of way could be planted in appropriate wildlife "browse" to benefit wildlife. Establishing preferred wildlife forage could enhance the forest "edge" effect created by the rights-of-way and, therefore, improve the wildlife value of the forest corridor.

No known endangered species are within the area of direct construction impacts. Some bald eagle nests are in the proximity of the rights-of-way south of Laplace, as previously mentioned.

Impacts on the aquatic environment should be minimal and temporary. The major impact would be associated with the placement and operation of the intake structure. Temporary increases in turbidity, relocation of light, removal or displacement of benthic organisms, and possible disturbance

TABLE 27

RIVER PARISHES - PLAN 16

Supply from Vicinity of Baton Rouge

Real Estate: 3 acres fee, 260 acres pipeline rights-of-way, 307 acres construction easement	$ 27,086,000[1/]
Pumping Stations	
Intake, 309 cfs	$1,198,000
Booster, 309 cfs	998,000
Booster, 304 cfs	998,000
Booster, 214 cfs	898,000
Booster, 7 cfs	141,000
Pipelines	
22" submerged	3,750,000
24" line	7,891,000
24" submerged	2,000,000
36" submerged	2,750,000
36" line	3,825,000
38" line	773,000
60" line	2,534,000
72" line	463,000
84" line	13,558,000
87" line	6,583,000
90" line	46,335,000
Mitigation, minimal marsh loss	10,000
Subtotal	$121,791,000
Contingencies (25%)	23,209,000
Subtotal	$145,000,000
Engineering and Design (11%)	16,000,000
Supervision and Administration (11%)	16,000,000
TOTAL - PLAN 16	$177,000,000
Operation and Maintenance	$ 444,000

1/ Includes contingencies

of some shallow water shoal areas that may be used for spawning and feeding could result from construction of the water intake. In the operation of the intake structure, larval and juvenile fish and small benthic organisms could be entrained. If the intake is designed to minimize high inflow velocities, most of these impacts could be avoided.

Plan 17. In this alternative, several wells would be drilled into underground aquifers in the River Parishes and used to pump freshwater into the aquifers. The aquifers would act as storage for the required 200-MGD, 15-day supply. Using underground aquifers for storage is a new and unproven technique. Reliable design and cost data is not available for determining the possible location of the wells (see Figure 17). A demonstration project was to have been started in Houma but funding was cut before the project was completed. Based on the data developed for the project, the total first cost for the plan would be $60,000,000, as shown on Table 28.

The geologic conditions in the project area are not favorable for storing freshwater in an underground aquifer. The formations are such that freshwater would move vertically and horizontally, mixing with the saltwater. Establishing a stabilized storage pocket is not considered feasible. The problem was discussed in detail in the description of Plan 11. Annual charges for such a plan could not be computed.

Because there is a lack of information about the site and the number of wells needed, the impacts could only be generally estimated. Preparation of the well site and drilling operations would result in impacts associated with land clearing and burning, such as wind-blown dust. These impacts would range from minimal to moderate, depending on the location of the site, the water table in the area, and how the surrounding vegetation reacts to reductions in the water table. Saltwater intrusion may be induced if pumping is done in areas where seepage from the aquifer occurs.

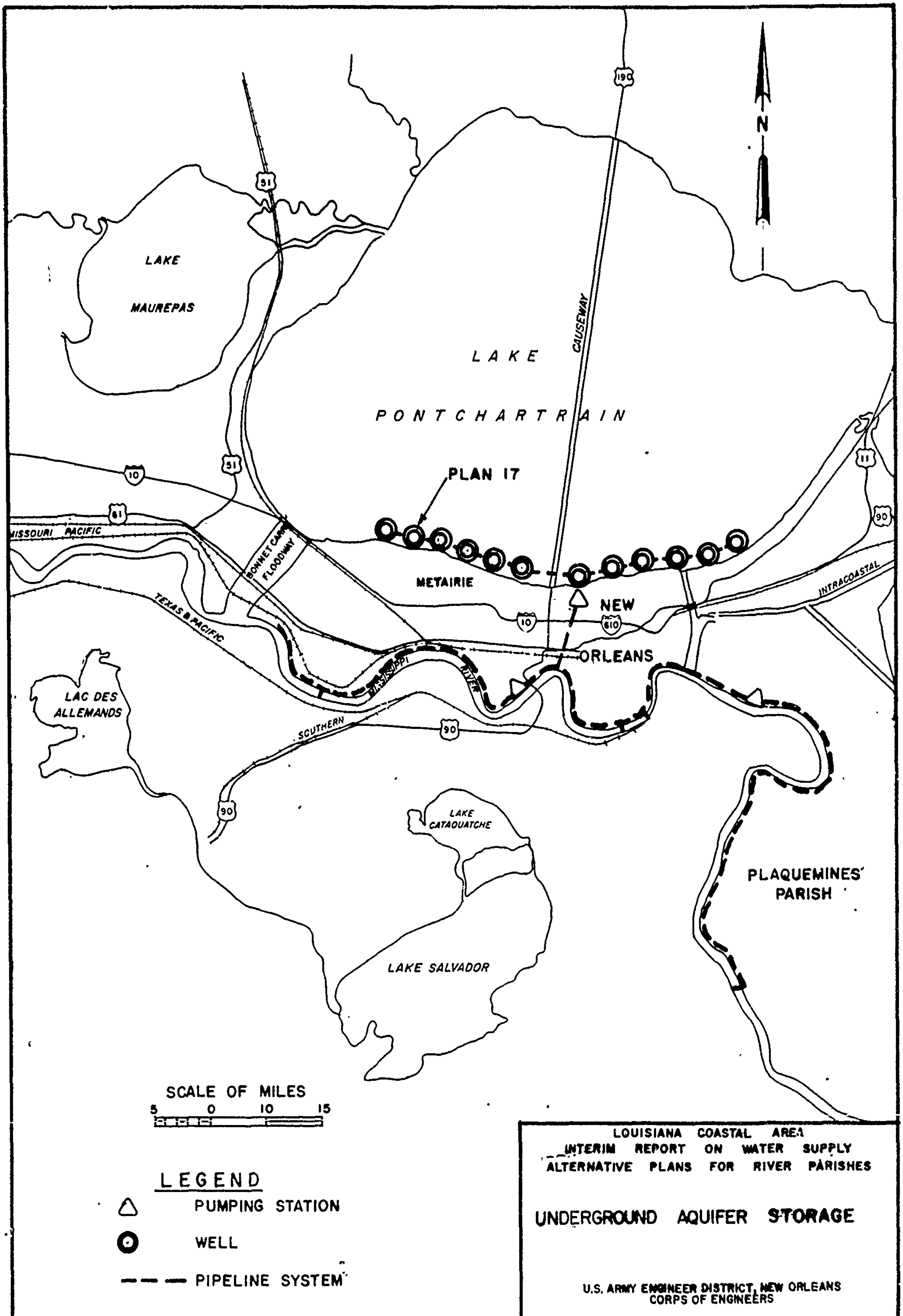

LAKE MAUREPAS
LAKE PONTCHARTRAIN
CAUSEWAY
PLAN 17
METAIRIE
NEW ORLEANS
MISSOURI PACIFIC
BONNET CARRE FLOODWAY
TEXAS & PACIFIC
MISSISSIPPI RIVER
SOUTHERN
INTRACOASTAL
LAC DES ALLEMANDS
LAKE CATAOUATCHE
LAKE SALVADOR
PLAQUEMINES PARISH
N
SCALE OF MILES
5 0 10 15
LEGEND
PUMPING STATION
WELL
PIPELINE SYSTEM
LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR RIVER PARISHES
UNDERGROUND AQUIFER STORAGE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 17

TABLE 28

RIVER PARISHES - PLAN 17

Store Fresh Water in Underground Aquifer

Real Estate	1/
Well system	$20,000,000
Piping and pumps	19,360,000
Mitigation, 3 acres of marsh	5,000
Subtotal	$39,365,000
Contingencies (25%)	9,835,000
Subtotal	$49,200,000
Engineering and Design (11%)	5,400,000
Supervision and Administration (11%)	5,400,000
TOTAL - PLAN 17	$60,000,000
Operation and Maintenance	$ 366,000

1/ Real estate costs included with cost of well system and piping and pumps.

Clearing, ditching, and backfilling would cause impacts associated with pipeline construction. The impacts of this activity would range from minor to moderate, depending upon the location. There would be a very low possibility that the implementation of the plan would affect cultural resources in the area.

Plan 18. This alternative would provide for use of groundwater northwest of Lake Pontchartrain (see Figure 18 for one possible location). About 50 wells would be required. The pumping stations and piping required for distribution of the water would be similar to Plan 15. The total first cost would be $115,000,000 (see Table 29). The average annual cost, including operation and maintenance, would be $10,000,000.

Well location and configuration are required for this alternative before impacts can be properly analyzed. The information was not available at this level of study, but it is assumed that the impacts of this alternative would be very similar to Plan 15 since the piping distribution system to the users would be the same for both plans.

Summary of River Parishes Alternatives. Plan 17 has the lowest first cost but is not feasible because of unfavorable geologic conditions in the area. Table 30 summarizes the costs of the alternative plans. Plan 13 is the least costly of the feasible plans. Plan 14 is the second least costly. Both Plans 13 and 14 would alter a limited amount of waterfowl habitat and are highly controversial. Plan 14 is more environmentally acceptable than Plan 13. Both Plans 13, 14, and other least controversial plans should be studied in more detail.

CAMERON-HOLLY BEACH

Since both surface water and groundwater sources are brackish, the alternatives for supplying water to this area are limited. By the year

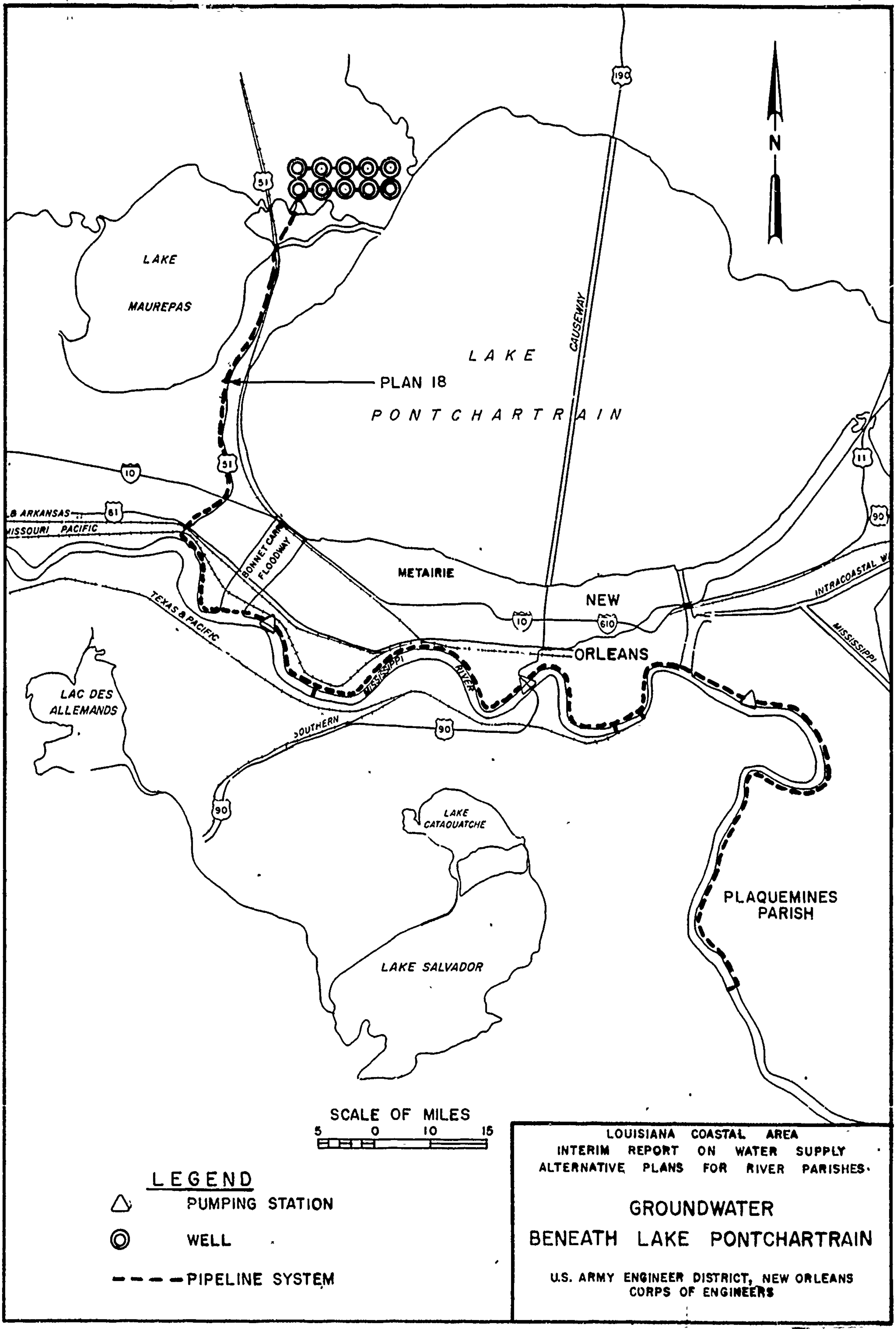

N
190
51
LAKE
MAUREPAS
LAKE
PONTCHARTRAIN
PLAN 18
CAUSEWAY
10
51
61
MISSOURI PACIFIC
BONNET CARRE FLOODWAY
METAIRIE
NEW
ORLEANS
10
610
11
90
INTRACOASTAL
MISSISSIPPI
TEXAS & PACIFIC
MISSISSIPPI RIVER
LAC DES ALLEMANDS
SOUTHERN
90
90
LAKE CATAOUATCHE
LAKE SALVADOR
PLAQUEMINES PARISH
SCALE OF MILES
5 0 10 15
LEGEND
PUMPING STATION
WELL
PIPELINE SYSTEM
LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR RIVER PARISHES
GROUNDWATER
BENEATH LAKE PONTCHARTRAIN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 18

TABLE 29

RIVER PARISHES - PLAN 18

Groundwater Underneath Lake Pontchartrain

Real Estate	1/
Well System	$20,000,000
Piping and Pumps	55,200,000
Mitigation	5,000
Subtotal	$75,205,000
Contingencies (25%)	18,795,000
Subtotal	$94,000,000
Engineering and Design (11%)	10,500,000
Supervision and Administration (11%)	10,500,000
TOTAL - PLAN 18	$115,000,000
Operation and Maintenance	$ 490,000

1/ Real estate costs included with cost of well system and piping and pumps.

TABLE 30

RIVER PARISHES ALTERNATIVES

Economic Summary

Alternative		First Cost	Annual Cost
Plan 13	Storage at Davis Pond	$ 73,300,000	$ 6,320,000
Plan 14	Storage at Big Mar	95,800,000	8,190,000
Plan 15	Supply from Lake Maurepas	146,000,000	12,500,000
Plan 16	Supply from vicinity of Baton Rouge	177,000,000	15,100,000
Plan 17	Storage at freshwater in underground aquifer	60,000,00	1/
Plan 18	Groundwater from north of Lake Pontchartrain	115,000,000	10,000,000

1/ Plan not feasible. Annual cost not computed.

2020, the community will require 3.2-MGD-supply of fresh water. Water can be imported or desalinated. Several alternatives were investigated.

Plan 19. In this plan, water would be imported from the Lake Charles municipal water supply system via pipeline to the Cameron-Holly Beach area (see Figure 19). The plan would include two 4.95-cfs pumps and 24- to 12-inch diameter pipelines. The 54-mile-long pipeline would parallel Louisiana Highway 27. The plan would include a tank elevated 135 feet with the capacity to store 500,000 gallons for emergencies. Under this alternative, the existing treatment facilities would no longer be needed since the water would be purchased from the Lake Charles system.

The plan would have a total first cost of $29,400,000, as shown on Table 31. Average annual costs, including operation and maintenance, would be $3,140,000.

Approximately 193 acres of land would be directly affected by pipeline construction. One hundred and eleven of these acres would be wildlife habitat (108 acres brackish marsh and 3 acres evergreen forest).

The remaining 82 acres consist of 45 acres of crop and pasture land, 21 acres of industrial land, and 16 acres of residential land. Impacts of pipeline construction and the three subaqueous crossings (Second Lagoon, Bayou Choupique, and the Intracoastal Waterway) would be similar to those in Plan 1.

The pipeline would be adjacent to the Sabine National Wildlife Refuge and care should be taken to minimize impacts on the area. The proposed pipeline crossing north of Lake Calcasieu may affect active nesting colonies of egret, ibis, and heron due to the proximity of construction

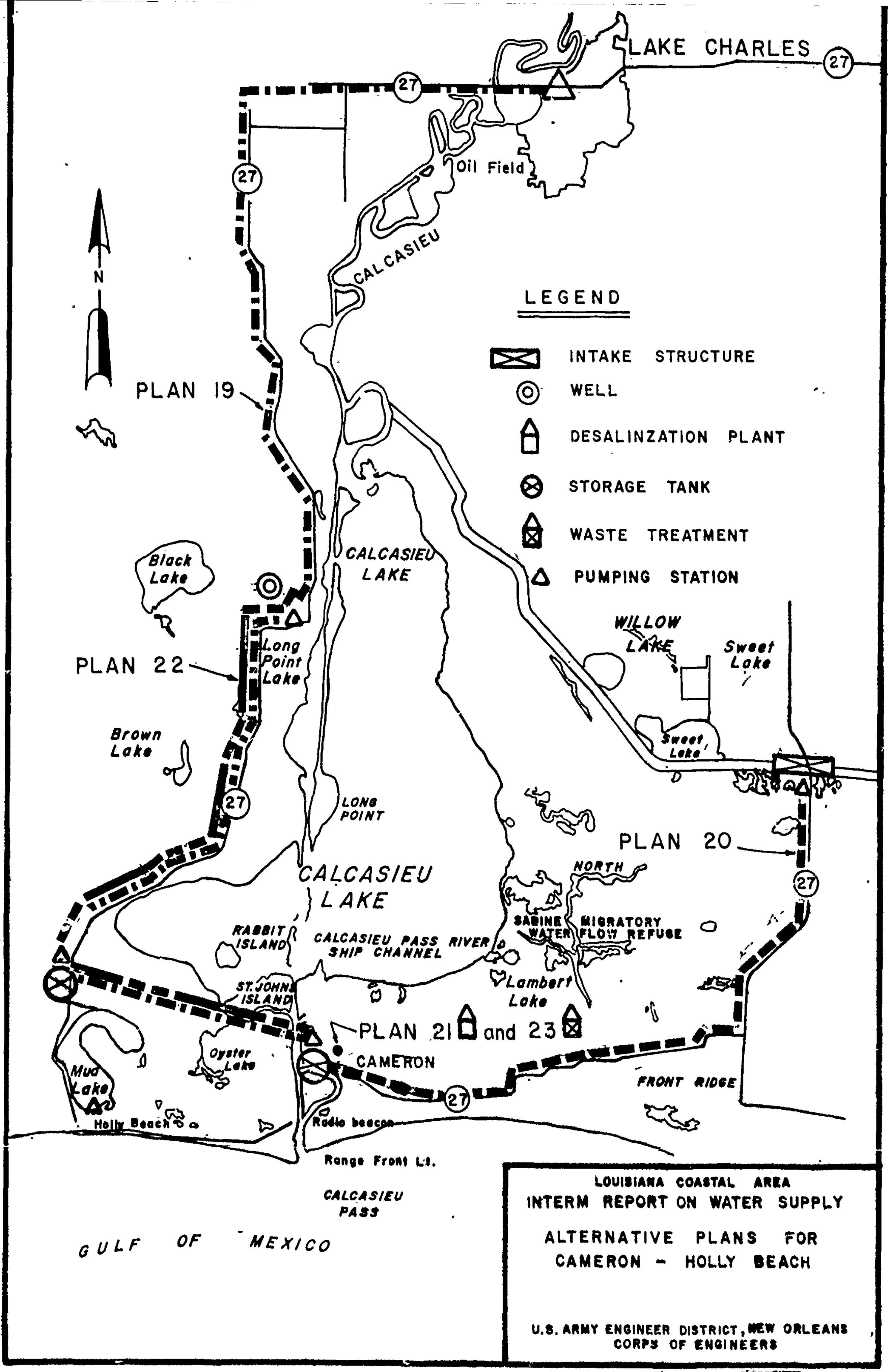

LAKE CHARLES
27
Oil Field
CALCASIEU
N
LEGEND
INTAKE STRUCTURE
WELL
DESALINZATION PLANT
STORAGE TANK
WASTE TREATMENT
PUMPING STATION
PLAN 19
Black Lake
CALCASIEU LAKE
WILLOW LAKE
Sweet Lake
PLAN 22
Long Point Lake
Brown Lake
Sweet Lake
LONG POINT
PLAN 20
NORTH
CALCASIEU LAKE
SABINE WATER FLOW
MIGRATORY REFUGE
RABBIT ISLAND
CALCASIEU PASS RIVER SHIP CHANNEL
ST. JOHNS ISLAND
Lambert Lake
PLAN 21 and 23
Oyster Lake
CAMERON
Mud Lake
FRONT RIDGE
Holly Beach
Radio beacon
Range Front Lt.
CALCASIEU PASS
GULF OF MEXICO
LOUISIANA COASTAL AREA
INTERM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS FOR
CAMERON - HOLLY BEACH
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FIGURE 19

TABLE 31

CAMERON-HOLLY BEACH - PLAN 19

Import Water from Lake Charles Via Pipeline

Real Estate: 79 acres in fee, 132 acres construction easement	$1,440,000 1/
Pumping Stations	
Intake, 4.95 cfs	$ 110,000
Booster, 2 pumps, 4.95 cfs	270,000
Pipelines	
12" line	610,000
22" line	1,670,000
22" submerged	230,000
24" line	14,200,000
24" submerged	340,000
Elevated Tank (500,000 gal.)	500,000
Mitigation, 108 acres of brackish marsh	170,000
Subtotal	$19,540,000
Contingencies (25%)	4,560,000
Subtotal	$24,100,000
Engineering and Design (11%)	2,600,000
Supervision and Administration (11%)	2,700,000
TOTAL - PLAN 19	$29,400,000
Operation and Maintenance	$ 698,000

1/ Includes contingencies

activity. Pipeline construction would temporarily disrupt use of the lake side of the Creole Nature Trail.

No known archeological sites are in the project area. However, a high possibility exists that cultural resources would be affected by implementation of this plan.

Plan 20. In this alternative, surface water would be imported from the Gulf Intracoastal Waterway (see Figure 19). A cast-iron pipeline would extend 37.7 miles from the Gulf Intracoastal Waterway to the communities of Cameron and Holly Beach. The plan also includes 3 pumping stations with 4.95-cfs capacity and a 100,000-gallon storage tank. Untreated water will be transported to the existing water treatment facilities at Cameron-Holly Beach.

The total first cost of the plan would be $17,200,000, as shown on Table 32. The average annual cost, including operation and maintenance, would be $1,550,000.

Approximately 126 acres of land would be affected by the pipeline, and construction rights-of-way. One hundred and eighteen acres are brackish marsh and only 3 percent of the marsh would return to near preconstruction conditions. Impacts of the pipeline would be similar to those previously described. Active nesting colonies of least terns are located in the proximity of the proposed pipeline segment connecting Holly Beach with Cameron. Nesting colonies of heron, egret, and cormorant are located along the proposed pipeline segment connecting the Gulf Intracoastal Waterway to Cameron. However, no endangered or threatened species or habitat are in the construction rights-of-way. No known archeological sites are in the project area, but the possibility is high that cultural resources will be affected by implementation of this plan.

TABLE 32

CAMERON-HOLLY BEACH - PLAN 20

Import Water from Intracoastal Waterway

Real Estate: 2 acres fee, 48 acres perpetual pipeline rights-of-way, 128 acres construction easement	$ 571,000 1/
Pumping Stations	
Intake pump, 4.95 cfs	$ 280,000
Booster, 3.96 cfs	140,000
Booster, 0.99 cfs	60,000
Ground Storage Tanks	
1-100,000 gal. cap.	150,000
1-400,000 gal. cap.	250,000
Pipelines	
14" line	1,400,000
14" submerged	230,000
24" line	8,100,000
Mitigation, 118 acres of marsh, nesting herons	190,000
Subtotal	$11,371,000
Contingencies (25%)	2,729,000
Subtotal	$14,100,000
Engineering and Design (11%)	1,500,000
Supervision and Administration (11%)	1,600,000
TOTAL - PLAN 20	$17,200,000
Operation and Maintenance	$ 120,000

1/ Includes contingencies

Plan 21. This alternative would use existing brackish groundwater as a source. Through a reverse-osmosis desalinization method, the sodium, chlorides, and other solids would be removed (see Figure 19). The plant would be located at a convenient site in Cameron and would use the existing water distribution system. The plan would require a 3.5-MGD brackish water desalinization plant, one additional 1-MGD-capacity well, and pipe connections to the existing water distribution system.

The first cost for this plan would be $9,100,000, as shown on Table 33. Annual charges, including operation and maintenance, would average $3,310,000.

Environmental impacts would be similar to those described for Plan 2. No known archeological sites are in the project area and there is just a moderate chance that the project would affect cultural resources in the area.

Plan 22. In this alternative, a more northerly groundwater supply from the Chicot aquifer would be used (see Figure 19). Two deep wells located in the vicinity of Hackberry would extract the water from the aquifer. The water would be transported 26.7 miles to the Cameron-Holly Beach area via 112- to 24-inch diameter pipelines. The plan would also include two 4.95-cfs pumping stations and a 500,000-gallon elevated storage tank.

The first cost of the plan would be $13,200,000, as shown on Table 34. Annual charges, including operation and maintenance, would average $1,240,000.

Construction impacts associated with piping groundwater from the vicinity of Hackberry are related to the use of approximately 121 acres of land. About 97 acres of this area is wildlife habitat composed of 73 acres

TABLE 33

CAMERON-HOLLY BEACH - PLAN 21

Brackish Water Desalinization

Real Estate: 3 acres commercial fee	$ 81,000 1/
Desalinization Plant, 3.5 MGD	5,200,000
Groundwater Well, 1 MGD cap	200,000
Pipe connection to existing system	450,000
Mitigation	60,000
Subtotal	$ 5,991,000
Contingencies (25%)	1,509,000
Subtotal	$ 7,500,000
Engineering and Design (11%)	800,000
Supervision and Administration (11%)	800,000
TOTAL - PLAN 21	$ 9,100,000
Operation and Maintenance	$ 2,560,000

1/ Includes contingencies

TABLE 34

CAMERON-HOLLY BEACH - PLAN 22

Import Groundwater From More Northerly Site Via Pipeline

Real Estate: 1 acre fee, 39 acres perpetual easement and 64 acres easement	$ 66,000 1/
Deep Groundwater Wells, 2 Wells	400,000
Pumping Station, 2 pumps - 4.95 cfs	270,000
Elevated Tank, 500,000 gal.	500,000
Pipelines	
12" line	610,000
22" line	1,670,000
22" submerged	230,000
24" line	4,800,000
Mitigation, 73 acres of marsh and 24 acres of lake bottom	115,000
Subtotal	$ 8,661,000
Contingencies (25%)	2,139,000
Subtotal	$10,800,000
Engineering and Design (11%)	1,200,000
Supervision and Administration (11%)	1,200,000
TOTAL - PLAN 22	$13,200,000
Operation and Maintenance	$ 150,000

1/ Includes contingencies

of brackish marsh and 24 acres of lake and stream bottoms. Impacts on these lands will be similar to the pipline impacts discussed in the previous plans.

There are no known archeological sites in the project area. However, a high risk of affecting cultural resources does exist along the route of the pipeline if this plan is implemented.

Plan 23. This plan consists of collection and purification of community wastewater for reuse (see Figure 19). Presently, however, these communities use individual septic tanks for waste disposal. Therefore, the plan would require construction of a completely new waste collection system as well as the necessary facilities to recycle the wastewater. While the recycled water may meet potable water standards, there may be other contaminants remaining in the water that are not measured. The plan would consist of a treatment plant and a pipeline to connect to the existing distribution system.

The total first cost, excluding the local collection system, would be $13,000,000, as shown on Table 35. Annual costs, including operation and maintenance, would average $1,800,000. Annual cost does not include the cost of a wastewater collection system which would be required with this plan.

The treatment plant site would cover three acres located in a built-up area. Construction impacts will be similar to those described for the desalinization plant except on a much smaller scale. The proposed collection system is to be within existing street and road easements. Therefore, only the minimal short-term impacts associated with pipeline construction applicable.

Summary of Cameron-Holly Beach Alternatives. Plan 22, to use a more northerly source of groundwater, is the least costly, considering the

TABLE 35

CAMERON-HOLLY BEACH - PLAN 23

Recycle Wastewater

Real Estate: 3 acres commercial fee	$ 81,000 1/
Treatment Plant	7,949,000
Piping connection to existing system	450,000
Mitigation	30,000
Subtotal	$ 8,510,000
Contingencies (25%)	2,090,000
Subtotal	$10,600,000
Engineering and Design (11%)	1,200,000
Supervision and Administration (11%)	1,200,000
TOTAL - PLAN 23	$13,000,000
Operation and Maintenance	$ 724,000

1/ Includes contingencies

annual cost as well as the first cost (see Table 36). Plan 20, to import water from the Gulf Intracoastal Waterway, is the second least costly. The two plans have similar environmental impacts. Both plans should be considered in more detailed studies.

MERMENTAU RIVER BASIN

Groundwater sources in the Mermentau River Basin have about reached their capacity, assuming projected increases in use. Additional water required to meet the projected need must be obtained either from redistribution of surface flow or by importation. By the year 2020, about 735 MGD of surface water will be required. Several water supply alternatives to meet this need were investigated (see Figure 20).

Plan 24. This alternative would consist of a system of levees, closures, and control structures around Grand and White Lakes to raise the level of the lakes about 1 foot. This raised level would provide additional storage of 100,000 acre/feet, which would provide the needed supplemental flow during the low flow period. The system would prevent the escape of fresh water to the gulf during high lake stages and saltwater intrusion during low stages. The plan would be highly undesirable from a water management and environmental standpoint because of the irregular shoreline of Grand Lake and the complex inflow and outflow pattern. The environmental impacts associated with the massive levee systems, closure, and the control structure would be severe. Artificial elevation and manipulation of the water level in the incoming streams could be detrimental to the fishery and other aquatic organisms. The proposed closure and the control structure would limit access of aquatic organisms to the lake and block any migratory routes that presently exist. In addition, artificial manipulation of the water levels would increase an already acute erosion problem in the area. Therefore, studies of this alternative were suspended and design and cost data were not developed.

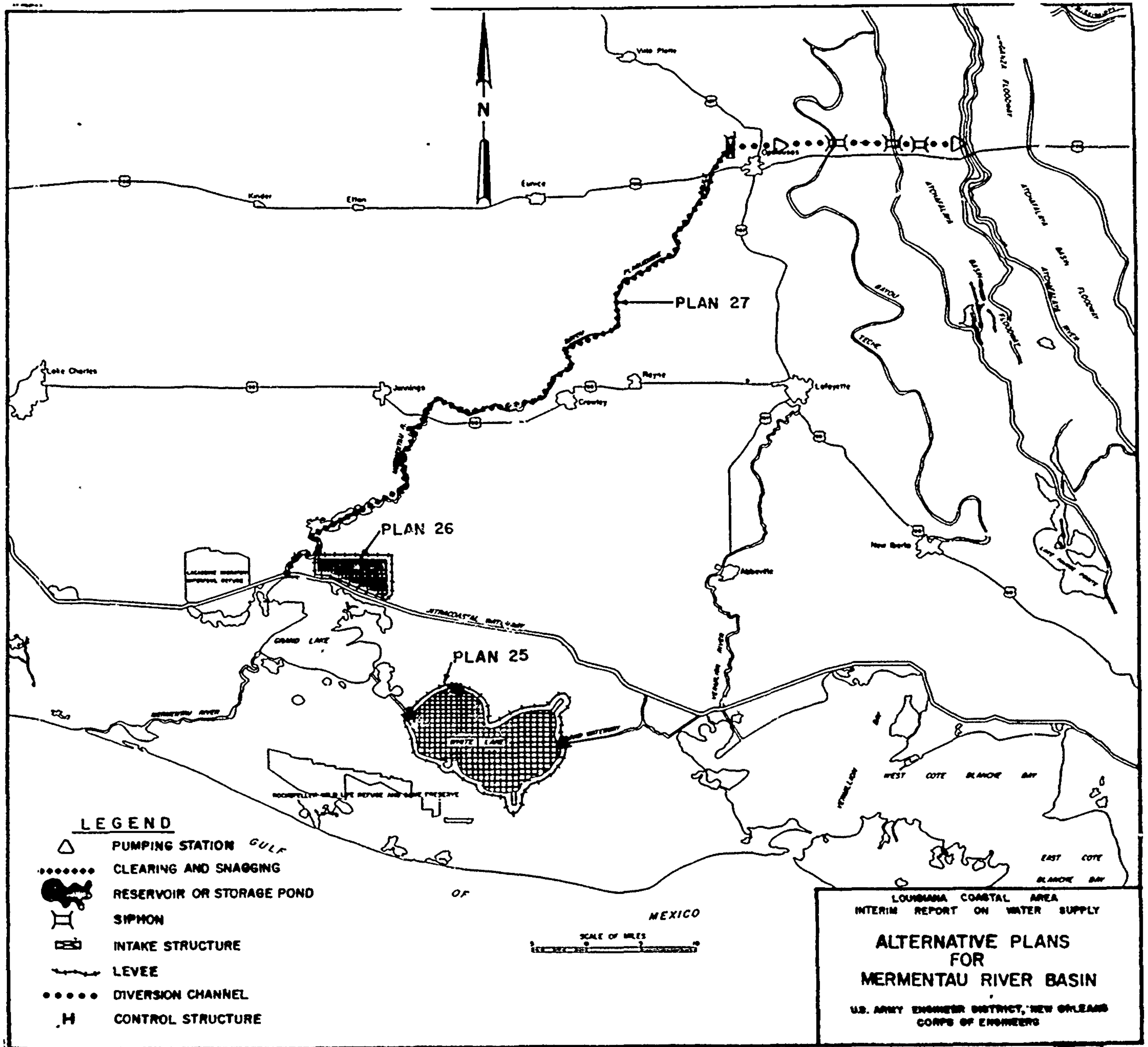

N
PLAN 27
PLAN 26
PLAN 25
Lake Charles
Jennings
Crowley
Rayne
Lafayette
Kinder
Elton
Eunice
Opelousas
Ville Platte
New Iberia
Abbeville
GRAND LAKE
WHITE LAKE
GULF OF MEXICO
WEST COTE BLANCHE BAY
EAST COTE BLANCHE BAY
LEGEND
PUMPING STATION
CLEARING AND SNAGGING
RESERVOIR OR STORAGE POND
SIPHON
INTAKE STRUCTURE
LEVEE
DIVERSION CHANNEL
CONTROL STRUCTURE
LOUISIANA COASTAL AREA
INTERIM REPORT ON WATER SUPPLY
ALTERNATIVE PLANS
FOR
MERMENTAU RIVER BASIN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FIGURE 20

FIGURE 20

TABLE 36

CAMERON-HOLLY BEACH ALTERNATIVES

Economic Summary

	Alternative	First Cost	Annual Cost
Plan 19	Pipeline water from Lake Charles	$29,400,000	$3,140,000
Plan 20	Import water from Intracoastal Waterway	17,200,000	1,550,000
Plan 21	Brackish water desalination	9,100,000	3,310,000
Plan 22	Import groundwater from more northerly site	13,200,000	1,240,000
Plan 23	Recycle wastewater	13,000,000	1,800,000 1/

1/ Does not include cost of wasterwater collection system.

Plan 25. In this alternative, the flow of the Mermentau River would also be redistributed by storage. The storage would be provided in White Lake (see Figure 20). Inflows and outflows to White Lake are much less complex and this plan would not be as detrimental to the environment as Plan 24. The lake level would be raised about 2 feet to provide the desired storage. About 60 miles of 7-foot-high levee would be constructed along with 2 control structures and 1 navigable control structure.

The total first cost of the plan would be $77,700,000, as shown on Table 37. Average annual cost, including operation and maintenance, would be $6,650,000.

The levee would be constructed just inside the water's edge. The benthic resources would incur the most significant impacts. Approximately 850 acres of benthic habitat would be removed from production by levee placement and the sessile animals would be destroyed by burial. The material for levee construction would be obtained from in-lake borrow sites approximately 250 feet offshore. An additional 550 acres of benthic habitat would be disturbed by the hydraulic dredging to the 9-foot depth below present bottom that is required to obtain suitable material for levee construction. Some degree of recovery is expected over time and species composition would probably change. Deepening the shallow nearshore waters could have a significant effect on spawning success and the viability of the fishery.

Information available at this time is not sufficient to quantify the signficance of the loss in benthic habitat. Past studies have indicated (Morton, 1973) approximately 74 percent of the total fish catch from White Lake is composed of fish and shellfish dependent on the benthic food chain at some stage in their life cycle. The benthic habitat affected

TABLE 37

MERMENTAU RIVER BASIN - PLAN 25

Storage in White Lake

Real Estate: 6 acres fee, 1,090 acres perpetual levee right-of-way,	$ 378,000[1/]
Levee and Flotation Channel	7,645,000
Two Saltwater Barriers, Non-Navigable	21,624,000
Saltwater Barrier, Navigable	14,416,000
Mitigation, 1,400 acres of benthic habitat, 237 acres of marsh	7,000,000
Subtotal	$51,063,000
Contingencies (25%)	12,637,000
Subtotal	$63,700,000
Engineering and Design (11%)	7,000,000
Supervision and Administration (11%)	7,000,000
TOTAL - PLAN 25	$77,700,000
Operation and Maintenance	$ 211,000

1/ Includes contingencies

represents only 3 percent of the benthic habitat available in White Lake. This low percentage should not necessarily be interpreted as an insignificant loss. This nearshore benthic habitat is normally more productive than deep water benthic habitat due to the nutrient enrichment from the adjacent marshes. In addition, because of the proximity of the habitat to the marsh, it is more heavily used for food base by spawning and juvenile fish species than the deep water areas.

Other construction impacts would be related to temporary increases in turbidities that could limit the feeding ability of sight feeders and filter feeders, reduce plankton production, and possibly clog the gills of organisms near the dredging or disposal operation. Temporary degradation in water quality is expected because of depressed dissolved oxygen levels and release of soil-bound contaminants. The 9-foot depths in the borrow pits would not receive continual circulation as designed. Without the appropriate circulation, these pits could act as nutrient and contaminant sumps that would become anoxic during the warmer months of the year. Elevated chlorides, sulfates, and PCB levels have been recorded in the lake and tributaries. The mean values of these constituents have exceeded EPA criteria levels for aquatic life. The impacts of the subaqueous borrow pits should progressively diminish over time as the areas are filled.

During levee construction, runoff from the dredged material would affect approximately 300 acres of marsh. This fresh-to-intermediate marsh is used both as a spawning and nursery area by various species of fish. Migratory waterfowl use it during certain times of the year along with the various amphibians, reptiles, and furbearing mammals. The change in elevation caused by the runoff of dredged material could alter vegetative communities along the area of impact. The levee would isolate the marsh from the adjacent lake and prevent nutrient and detrital exchange.

No endangered species are noted in the area of direct construction. However, the red wolf, eskimo curlew, threatened peregrine falcon, and Bachman's warbler might be found within the coastal study area. The

peregrine falcon migrates through the chenier plain area in the spring and fall, and may overwinter. The eskimo curlew may migrate through during the spring.

Water level fluctuation required for the water supply needs would not coincide with the water level variations needed to produce a viable habitat conducive to a successful fishery. The water control structures would provide barriers to the migrating species and, therefore, limit the influx of white shrimp into White Lake.

The probability of affecting cultural resources with the plan is moderate to high. Prehistoric sites could be encountered in buried levees. One known site is in the area.

Plan 26. This alternative consists of 20 miles of levee to inclose a reservoir in the Maple Marsh area (see Figure 20). The levee was designed to provide an average water depth of 8 feet over an area of 12,500 acres. The reservoir would be filled by a system combining gravity flow and pumping from the Mermentau River. Control structures would be provided on the Mermentau River at the western end of the reservoir and on the Gueydan and Lulu Canals at the eastern end. A third control structure would be required for the Gueydan Canal and would prevent loss of flow from the reservoir into Grand Lake. The plan would have a first cost of $42,500,000 (see Table 38). Average annual costs, including operation and maintenance, would be $3,840,000.

In this alternative, a freshwater reservoir would be created by impounding approximately 12,500 acres of land. This acreage is composed of approximately 68 percent freshwater marsh, 11 percent shallow water ponds and lakes, and 31 percent agriculturally developed lands.

TABLE 38

MERMENTAU RIVER BASIN - PLAN 26

Storage North of GIWW in Maple Marsh

Real Estate: 3 acres fee, 4 acres perpetual pipeline easement 12,900 acres perpetual levee easement (reservoir), 2 acres construction easement	$ 7,766,000 1/
Levee, 20 miles	9,814,000
Intake Pump, 379 cfs	2,264,000
Intake and Outlet Pipes, 96"	263,000
Outlet Culverts, 12' x 12'	690,000
Outlet Channel, 10' BW	60,000
Control Structure, 2-12' x 25' Rollergates	4,885,000
Mitigation, 8,500 acre of marsh, 1,375 acres of waterbottoms	3,700,000
Subtotal	$29,442,000
Contingencies (25%)	5,458,000
Subtotal	$34,900,000
Engineering and Design (11%)	3,800,000
Supervision and Administration (11%)	3,800,000
TOTAL - PLAN 26	$42,500,000
Operation and Maintenance	$ 317,000

1/ Includes contingencies

The marsh to be enclosed by the proposed construction has been previously segmented by levees, drainage canals, oil exploration canals, and farm-roads. Because of these developments and drainage associated with the heavy agricultural uses within the area, the productivity of the upper marsh has been diminished. However, that portion of the marsh to the east and northeast of Oak Island has not been severely modified and is probably the most productive habitat in the proposed leveed area. The area is heavily used by waterfowl due to the large areas of open water and abundant floating aquatic vegetation. While some segmentation and channelization have occurred in this area, the marsh is not completely cut off from Grand Lake. The marsh can still provide nutrient and detrital input to Grand Lake through the Lulu Canal and GIWW. While the fishing production of this area is not expected to be exceptional, the marsh does provide additional spawning, nursery, and feeding areas for both the fresh and marine species found in Grand Lake.

The impacts of levee construction would vary according to the type of equipment used. The least damaging method would be hauled-fill construction where access is available because this method would only affect the immediate area of the levee placement (approximately 400 acres). If levee construction is acomplished by dragline or bucket dredge, borrow canals would be created in addition to the impact on habitat caused by levee placement. These borrow canals would tend to act as pathways for saltwater intrusion and marsh erosion that could lead to further marsh deterioration. Modification of water circulation in the marsh through levee placement and associated canal creation would create artificial, poor quality water bodies that may become anoxic. During levee construction, vegetation would be destroyed, runoff would be increased, oxygen demand in the marsh would be increased, and plankton productivity would decrease.

Further isolating the marshes from the Grand Lake system through impoundment would greatly diminish the nutrient and detrital input. With the reservoir in place, the marsh would act as a settling basin for the sediment-laden water pumped from the Mermentau River for storage. Sedimentation that would occur within the reservoir with the 8-foot depth

of water produced over the leveed marsh would eliminate submerged vegetation and probably greatly reduce floating vegetation. The value of the Maple Marsh area would be greatly reduced and the use for overwintering waterfowl may be eliminated. Maple Marsh is one of the highly rated (No. 6 out of 14) privately owned key waterfowl areas in the Central Gulf Coast Wetlands (U.S. Fish and Wildlife Migratory Bird Preservation Project, 1982). Approximately 60,000 overwintering waterfowl use the Maple Marsh area. The more upland portions of the marsh are used by approximately 30,000 snow geese. Therefore, the impounding of this area and the resultant loss in submerged vegetation could have a significant effect on these overwintering populations.

Since water supply needs would coincide with the warmer months, the nutrient-rich water introduced into the Grand Lake system from the reservoir may degrade the water quality and may indirectly and adversely affect the local fishery.

If this alternative is pursued, the levee alinement should be modified to exclude the marshes east and northeast of Oak Island. Levee heights could be increased so that the same storage capacity could be achieved with less acreage. With these modifications, the majority of the waterfowl area could be preserved. Other solutions may be possible by managing water levels in the reservoir to stimulate adequate plant growth. Further study would be required to determine if water level requirements would be compatible.

No archeological sites are known to exist in the project area. However, the probability of affecting cultural resources is high. Prehistoric sites could be encountered on the terrace margin, on possible buried terrace remnants, and on possible buried levees.

Plan 27. In this alternative, water would be imported from the Atchafalaya River. Seven hundred and thirty-five million gallons a day would be diverted from the Atchafalaya River two miles north of Krotz Springs, Louisiana (see Figure 20). The diversion would be accomplished by developing a series of pumping stations, open channels, and siphons that would transport the water westward from the Atchafalaya River to Bayou Plaquemine Brule', and then to the Mermentau River. The system would consist of 3 pumping stations, 17 miles of channels, 2 siphons, and clearing and snagging 45 miles of Bayou Plaquemine Brule'. The first cost of the plan would be $82,300,000, as shown on Table 39. The average annual charge, including operation and maintenance, would be $8,170,000.

The construction of the diversion channel, associated siphons, and pumping stations would permanently change land use on 75 acres. Additional construction activity would result in the loss of natural cover and topsoil, which would cause an increase in runoff, erosion, and turbidity in nearby watersheds. Environmental impacts of subaqueous crossings at State Canal and Bayou Courtableau are similar to those in Plan 1.

Bayou Plaquemine Brule' and the Mermentau River would be used as the conveyance channel for diverting the Atchafalaya water to its eventual destination. Approximately 45 miles of Bayou Plaquemine Brule' would be cleared and snagged. This stream has been previously channelized and the existing aquatic community is adapted to a somewhat altered habitat and flow regime. The proposed snagging operation would result in direct removal of submerged structures used by various fish species for cover and nesting areas. These submerged structures also provide an attachment surface for various benthic species used as fish food organisms. The site of actual structure removal would result in the removal or disruption of

TABLE 39

MERMENTAU RIVER BASIN - PLAN 27

Divert Flow from Atchafalaya River

Real Estate: 2 acres fee, 60 acres perpetual pipeline easement, 30 acres construction easement for pipeline, 315 perpetual channel easement, and 105 acre construction easement for channel	$ 2,495,000 1/
Pump Stations	
Intake, 5-54," 227 cfs	$ 3,450,000
Booster, 5-54," 227 cfs	3,360,000
Discharge, 5'72," 277 cfs plus 5 miles of 5-72" pipeline	19,740,000
Channels	
20' BW IV on 3H, 6.1 miles	4,431,000
60' BW IV on 3H, 10.9 miles	18,349,000
Siphons	
State Canal, 12' x 13'	433,000
Bayou Courtableau, 15' x 15'	854,000
Clearing and Snagging Bayou Plaquemine Brule', 45 miles	677,000
Mitigation, eliminate cover for benthics and fish	800,000
Subtotal	$54,489,000
Contingencies (25%)	13,011,000
Subtotal	$67,500,000
Engineering and Design (11%)	7,400,000
Supervision and Administration (11%)	7,400,000
TOTAL - PLAN 27	$82,300,000
Operation and Maintenance	$ 1,350,000

1/ Includes contingencies

the benthic organisms in the immediate area and direct removal of organisms inhabiting the structure. The snagging operations would cause temporary increases in turbidity as well as increases in siltation downstream for an extended period of time. The direct result of the snagging operation would be the disruption of an estimated 475 acres of benthic habitat. The exact rate of recovery for this benthic habitat is unknown. However, based on past experience, repopulation from adjacent benthic populations is expected over time. The postconstruction population may not achieve the density or diversity of species that originally occupied this habitat. The overall significance of the effect depends on the food habits of the existing fish population. Since the stream has been previously channelized, it is expected that the present fishery has adapted to a food base that can tolerate high velocity, low nutrient environments.

Aside from the impacts directly associated with construction, secondary impacts could occur as a result of the alteration in flow regime induced by the diversion. Velocities are the dominant factor in determining the biological character of a stream (Fraser, 1972). The introduction of additional flow combined with the snagging and clearing operations is expected to significantly increase stream velocities. As a result, increases in turbidity, local flooding problems, bottom erosion, and bankerosion could be expected. These high stream velocities also tend to make "drift organisms" (plankton, small invertebrates) and early life stages of various fish species less available for food sources due to the rapid movement through the area. The resultant increase in bedload as a function of accelerated velocities would result in the sweeping away of organic matter. This would redistribute fine silts that might fill in bottom depressions once used for cover by spawning and other smaller fish.

The Lacassine Migratory Waterfowl Refuge is in the general area but not in the area of construction impacts. The increase in fresh water from the diversion would possibly freshen the marshes in the Lacassine Refuge and Grand Lake immediately adjacent to the point of entry to Grand Lake.

There is no documentation of endangered or threatened species or their critical habitat in the area of direct impact. However, the threatened Arctic peregrine falcons are occasionally observed along the coastal area during fall and spring.

No archeological sites are known to exist in the project area. However, the probability of affecting cultural resources in the area is high.

The continual flow through Bayou Plaquemine Brule' may aid in providing a fishery during the entire year. The bayou is presently intermittent due to low flows. The continual flow would also aid in minimizing the cumulative build-up of pesticides and other chemicals in the sediments during low flow.

Summary of Mermentau River Basin Alternatives. Plan 26, storage north of the GIWW, is the least costly (see Table 40). As preliminarily laid out, the plan would alter the very pro-ductive Maple Marsh area. However, with proper design modifications, the effect on the area would be minimized. Plans 25 and 27 are costly and both have objectionable environmental impacts. Plan 26 and possibly another storage site that might not be environmentally detrimental should be analyzed in more detailed studies.

CONCLUSION

Of the 27 plans developed and evaluated, 3 were determined to be not feasible and 13 were not economically justified. The remaining 11 plans should be retained for more detailed investigation in a feasibility study.

Grand Isle

Plan 1	Import additional water via pipeline from Leeville.
Plan 3	Remove salt from brackish groundwater with desalinization plant.
Plan 5	Import water by barge.

TABLE 40

MERMENTAU RIVER BASIN ALTERNATIVES

Economic Summary

	Alternative	First Cost	Annual Cost
Plan 24	Storage in Grand and White Lakes	1/	1/
Plan 25	Storage in White Lake	$77,700,000	$6,650,000
Plan 26	Storage north of GIWW	42,500,000	3,840,000
Plan 27	Divert flow from Atchafalaya River	82,300,000	8,170,000

1/ Costs not analyzed.

Houma Area

Plan 6 Saltwater Barrier.

Plan 7 Import water via pipeline from Lafourche Parish system.

Plan 9 Redistribute Intracoastal Waterway supply by storage.

Plaquemines Parish

Plan 12 Redistribute Mississippi River flow by storing water in lower Plaquemines Parish.

River Parishes

Plan 13 Redistribute Mississippi River flow by storing water at Davis Pond diversion site.

Plan 14 Redistribute Mississippi River flow by storing water at site of Big Mar freshw. er diversion.

Cameron-Holly Beach

Plan 20 Import water from Intracoastal Waterway east of Calcasieu Lock via pipeline.

Plan 22 Import groundwater via pipeline from site well north of saline-freshwater interface.

Mermentau River Basin

Plan 26 Redistribute flow of Mermentau River by storing water in leveed area north of the Gulf Intracoastal Waterway.

REQUIREMENTS FOR FURTHER STUDY

This initial evaluation provides the basis to evaluate the merits of continuing the study of the identified problem areas. In the next phase, feasibility studies would be conducted that would result in a report

with recommendations to Congress. The initial evaluation identified six problem areas for which additional studies are warranted. The problem areas extend across coastal Louisiana in several different parishes. Detailed study of each problem area would probably be accomplished on separate time schedules and in cooperation with different local sponsors. Therefore, in the interest of expediting the high priority studies and not being delayed by the slower-moving ones, the detailed studies have been divided into six interim feasibility investigations. A separate report will be prepared for each problem area. A more detailed level of analysis will be undertaken in the feasibility phase to determine economic feasibility and to address engineering and environmental concerns more completely. All studies will be conducted in accordance with applicable Federal policies and U.S. Army Corps of Engineers guidelines and regulations.

ECONOMIC STUDIES

Economic base studies, including population and other socioeconomic data, will be required to more fully evaluate existing conditions and alternative plans. Economic evaluation of the alternatives will require projections of economic activity over a 50-year period. An analysis of all sources of water supply as well as projections of water use will be required. Projected water use will be compared with future water supplies to determine if there are any deficits. An analysis will be made of the intensity, frequency, and duration of the expected deficits. These deficits will be addressed through structural and nonstructural alternatives, with and without Federal assistance.

ENGINEERING STUDIES

Hydrologic and hydraulic studies, including analyses of flow frequencies, rainfall-runoff relationships, and salinity intrusion, will be conducted to evaluate the effectiveness of alternative plans in addressing the defined

problems. Topographic surveys will be made to ascertain characteries of potential water storage areas. Test wells and water quality testing will be used to determine the quantity and quality of potential new ground water supplies.

General design studies and cost estimates for each alternative investigated will be prepared. The general design studies will involve determining real estate requirements, relocation requirements, structural designs, geometric channel layouts, dredged material placements, embankment designs and layouts, access road locations, seepage studies, and bank protection requirements. Cost estimates will require the quantification of construction materials and related items for each alternative plan and will be based on unit costs applicable to the study area. Cost estimates for nonstructural features of the alternatives will be developed.

ENVIRONMENTAL STUDIES

Additional studies are needed to properly examine environmental impacts. Studies will be performed to obtain the biological data needed to prepare an environmental impact analysis. The U.S. Fish and Wildlife Service in coordination with the New Orleans District will identify significant resources and quantify the environmental impact on these resources. Further coordination and synthesis of information from various Federal, state and local agencies will be necessary. Land use and habitat losses will be identified, quantified, and translated into environmental and economic impacts. In addition, the results of environmentally related studies from hydrology would be analyzed and incorporated into the impact assessment. Endangered species assessments, 404(b)(1) Evaluations and coastal zone management (CZM) consistency determinations will also be prepared. Cultural resources and recreational needs and opportunities will be developed so that physical and economic impacts would be identified.

STUDY PARTICIPATION AND COORDINATION

An essential part of the planning process is the participation and coordination of the public and Federal, state, and local agencies. During the study, an effort was made to promote two-way communication between study planners and local, state, and Federal officials and the public. Avenues of public involvement included public notices, interagency meetings, formal and informal contacts through correspondence, special topic meetings, and public meetings.

The original public meetings for he parent study were held in Jennings, Houma, and New Orleans, Louisiana, in November and December 1968. Local interests expressed concern about a number of issues including water supply.

A notice of study initiation was mailed in October 1983 to Federal, state and local agencies and officials, local libraries, news media, post offices, environmental groups, industries, and interested individuals. The notice outlined the stud[illegible]se and asked that any comments or suggestions pertaining to this [illegible] be submitted.

A number of meetings were held with local interests. After the problem areas were identified, interviews were held with concerned parish officials to discuss needs and possible solutions. A brochure discribing study findings was mailed to all agencies and the public in July 1984. On August 27, 28, and 30, 1984, public meetings were held in Belle Chasse, Houma, and Cameron, Louisiana respectively. (See summary and comments received at the meetings in Appendix B.)

This study has also been closely coordinated with the U.S. Fish and Wildlife Service (USFWS) field office. (See USFWS letters and Planning Aid Report in Appendix A.) The Department of Interior has jurisdiction over the Coastal Barrier Resources Act and the New Orleans District has maintained coordination concerning the act.

STUDY COST AND SCHEDULE

Six water supply problem areas were identified within the coastal limits in the initial evaluation. Five of these should be investigated in interim studies under the Louisiana Coastal Area Study. The sixth, Mermentau River Basin, is closely related to the Grand and White Lakes Water Management Study, Louisiana, presently underwav nd could best be accomplished with that study.

The total study cost is $3,800,000 as shown in Table 41. One possible funding schedule is shown in Table 42. Copies of the PB-6's for the five interim studies are attached.

A typical bar chart for the Houma Area Interim Study is shown in Table 43. Major schedule dates for the Houma Area study are:

Draft Report and DFEIS to LMVD	DEC 86
DEIS to EPA	MAY 87
Public Meeting	JUN 87
Feasibility Report and FEIS to LMVD	SEP 87

TABLE 41

ESTIMATED STUDY COST

INITIAL EVUALATION	$ 400,000
Interim Studies	
Houma Area	480,000
Cameron-Holly Beach	990,000
Grand Isle	850,000
River Parishes	600,000
Plaquemines Parish	480,000
Total Study Cost	$3,800,000

TABLE 42

STUDY SCHEDULE

Assuming 50-Percent Cost Sharing With Non-Federal Interests

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
Houma Area	75	85	80			
Cameron-Holly Beach	75	150	150	120		
Grand Isle		75	125	100		
River Parishes			75	125	100	
Plaquemines Parish				75	85	80
Total Federal	150	310	430	445	285	80

$1,700,000

TABLE 43

INTERIM WATER SUPPLY REPORT ON HOUMA AREA - STUDY SCHEDULE

	FY 1985	FY 1986	FY 1987
PLANNING			
PUBLIC INVOLVEMENT	5		8
PLAN FORMULATION	5	8	
STUDY MANAGEMENT	15	15	7
REPORT PREPARATION		24	32
ECONOMICS	10	8	2, 3, 2
SOCIAL STUDIES		7	3
ENVIRONMENTAL			
ENVIRONMENTAL QUAL.	25	14	13, 3, 2
RECREATION		3	2
CULTURAL RESOURCES		2	2
ENGINEERING			
SURVEYS AND MAPPING	20		
HYDROLOGY & HYDRAULICS	8	3	1, 1
FOUNDATIONS & MATERIALS		8	1, 1
DESIGN AND COST ESTIMATE		15	11, 2, 2
RELOCATIONS		3	
REAL ESTATE			8
LMVD	4	4	2
FISH AND WILDLIFE	8	6	2
SUPER. & ADMIN.	17	20	18
CONTINGENCIES	33	30	32
	150	170	160

RECOMMENDATION

Approval of this initial evaluation report is recommended.

Eugene S. Witherspoon

Eugene S. Witherspoon
Colonel, Corps of Engineers
District Engineer

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RCS: DAEN-CWB-12

STUDY COST ESTIMATE (PB-6)
($000)
For use of this form, see ER 11-2-220

APPROPRIATION TITLE: General Investigations

CATEGORY: Surveys

CLASS: Flood Damage Preventions

NAME OF STUDY: Louisiana Coastal. Area, LA. Water Supply 61610C

SUBCLASS:

LINE NO.	SUBACCOUNT NUMBER	SUBACCOUNT TITLE	CURRENT COST ESTIMATE: RECON-NOISSANCE PHASE	CURRENT COST ESTIMATE: FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: NON-FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: TOTAL FEASIBILITY PHASE	PREVIOUS FEDERAL COST ESTIMATE AND DATE APPROVED ( )	REMARKS
	a	b	c	d	e	f	g	h
1	61610C	Parent Study	400					Total Study Cost $3,800,000
2		Interim on Houma				480		
3		Interim on Cameron-Holly Beach				990		
4		Interim on Grand Isle				850		
5		Interim River Parishes				600		
6		Interim on Plaquemines Parish				480		
7		TOTAL	400			3,400		
8								
9								
10								
11								
12								
13								
14								

DATE PREPARED	DIVISION / DISTRICT	REGION / BASIN	Page of
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STUDY COST ESTIMATE (PB-6)
($000)
For use of this form, see ER 11-2-220

APPROPRIATION TITLE: General Investigations

CATEGORY: Surveys

CLASS: Flood Damage Preventions

NAME OF STUDY: Louisiana Coastal. Area, Interim Water Supply Study Houma Area

SUBCLASS:

LINE NO.	SUBACCOUNT NUMBER	SUBACCOUNT TITLE	CURRENT COST ESTIMATE: RECON-NOISSANCE PHASE	CURRENT COST ESTIMATE: FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: NON-FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: TOTAL FEASIBILITY PHASE	PREVIOUS FEDERAL COST ESTIMATE AND DATE APPROVED ( )	REMARKS
	a	b	c	d	e	f	g	h
1	.00	Cost through 30 Sep 78				0		Total Study Cost
	.01	Public Involvement				13		$480,000
2	.02	Institutional Studies				3		
	.03	Social Studies				10		
3	.04	Cultural Resources				4		
	.05	Environmental Quality				57		
4	.06	U.S. Fish & Wildlife Service				16		
	.07	Economic Studies				25		
5	.08	Surveys and Mapping				20		
	.09	Hydrology & Hydraulics				7		
6	.10	Foundations & Materials				10		
	.11	Design & Cost Estimate				33		
7	.12	Real Estate				5		
	.13	Study Management				32		
8	.14	Plan Formulation				13		
	.15	Report Preparation				61		
9	.20	Other Studies						
		Water Quality				6		
10		Recreation				5		
		LMVD				10		
11	.31	Supervision & Administration				55		NOTE: Study Costs are included in
12		SUBTOTAL				385		the latest PB for the parent study,
13		Contingencies				95		however, they were not broken out by individual item.
14		TOTAL				480		

DATE PREPARED:

DIVISION: Lower Mississippi Valley
DISTRICT: New Orleans

REGION: Lower Mississippi
BASIN: Coastal Louisiana

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STUDY COST ESTIMATE (PB-6) ($000) For use of this form, see ER 11-2-220	APPROPRIATION TITLE: General Investigations CATEGORY: Surveys CLASS: Flood Damage Preventions	NAME OF STUDY: Louisiana Coastal. Area, Interim Water Supply Study on Cameron-Holly Beach SUBCLASS:

LINE NO.	SUBACCOUNT NUMBER	SUBACCOUNT TITLE	CURRENT COST ESTIMATE: RECON-NOISSANCE PHASE	FEDERAL FEASIBILITY PHASE	NON-FEDERAL FEASIBILITY PHASE	TOTAL FEASIBILITY PHASE	PREVIOUS FEDERAL COST ESTIMATE AND DATE APPROVED ( )	REMARKS
	a	b	c	d	e	f	g	h
	.00	Cost through 30 Sep 78				0		Total Study Cost
1	.01	Public Involvement				18		$990,000
	.02	Institutional Studies				3		
2	.03	Social Studies				5		
	.04	Cultural Resources				9		
3	.05	Environmental Quality				56		
	.06	U.S. Fish & Wildlife Service				21		
4	.07	Economic Studies				20		
	.08	Surveys and Mapping				20		
5	.09	Hydrology & Hydraulics				6		
	.10	Foundations & Materials				294		Includes $250,000
6	.11	Design & Cost Estimate				70		for test well.
	.12	Real Estate				5		
7	.13	Study Management				46		
	.14	Plan Formulation				18		
8	.15	Report Preparation				68		
	.20	Other Studies						
9		Water Quality				6		
		Recreation				5		
10		LMVD				10		
11	.31	Supervision & Administration				110		NOTE: Study Costs are included in
12		SUBTOTAL				790		the latest PB for the parent study,
13		Contingencies				200		however, they were not broken out by individual item.
14		TOTAL				990		

DATE PREPARED	DIVISION: Lower Mississippi Valley DISTRICT: New Orleans	REGION: Lower Mississippi BASIN: Coastal Louisiana	Page of

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STUDY COST ESTIMATE (PB-6) ($000) For use of this form, see ER 11-2-220	APPROPRIATION TITLE: General Investigations	NAME OF STUDY Louisiana Coastal. Area, Interim Water Supply Study on Grand Isle
	CATEGORY Surveys	
	CLASS Flood Damage Preventions	SUBCLASS

LINE NO.	SUBACCOUNT NUMBER	SUBACCOUNT TITLE	CURRENT COST ESTIMATE: RECON-NOISSANCE PHASE	CURRENT COST ESTIMATE: FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: NON-FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: TOTAL FEASIBILITY PHASE	PREVIOUS FEDERAL COST ESTIMATE AND DATE APPROVED ( )	REMARKS
	a	b	c	d	e	f	g	h
1	.00 .01	Cost through 30 Sep 78 Public Involvement				0 14		Total Study Cost $850,000
2	.02 .03	Institutional Studies Social Studies				3 4		
3	.04 .05	Cultural Resources Environmental Quality				4 57		
4	.06 .07	U.S. Fish & Wildlife Service Economic Studies				21 16		
5	.08 .09	Surveys and Mapping Hydrology & Hydraulics				20 4		
6	.10 .11	Foundations & Materials Design & Cost Estimate				264 48		Includes $250,000 for test well.
7	.12 .13	Real Estate Study Management				7 36		
8	.14 .15	Plan Formulation Report Preparation				14 55		
9	.20	Other Studies Water Quality				 3		
10		Recreation LMVD				5 10		
11	.31	Supervision & Administration				95		NOTE: Study Costs are included in
12		SUBTOTAL				680		the latest PB for the parent study,
13		Contingencies				170		however, they were not broken out by
14		TOTAL				850		individual item.

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STUDY COST ESTIMATE (PB-6) ($000) For use of this form, see ER 11-2-220	APPROPRIATION TITLE: General Investigations	NAME OF STUDY: Louisiana Coastal. Area, Interim Water Supply Study on River Parishes
	CATEGORY: Surveys	
	CLASS: Flood Damage Preventions	SUBCLASS:

LINE NO.	SUBACCOUNT NUMBER	SUBACCOUNT TITLE	CURRENT COST ESTIMATE: RECON-NOISSANCE PHASE	FEDERAL FEASIBILITY PHASE	NON-FEDERAL FEASIBILITY PHASE	TOTAL FEASIBILITY PHASE	PREVIOUS FEDERAL COST ESTIMATE AND DATE APPROVED ( )	REMARKS
	a	b	c	d	e	f	g	h
1	.00 .01	Cost through 30 Sep 78 Public Involvement				0 17		Total Study Cost $600,000
2	.02 .03	Institutional Studies Social Studies				3 10		
3	.04 .05	Cultural Resources Environmental Quality				19 57		
4	.06 .07	U.S. Fish & Wildlife Service Economic Studies				31 25		
5	.08 .09	Surveys and Mapping Hydrology & Hydraulics				20 10		
6	.10 .11	Foundations & Materials Design & Cost Estimate				8 59		
7	.12 .13	Real Estate Study Management				7 43		
8	.14 .15	Plan Formulation Report Preparation				17 64		
9	.20	Other Studies Water Quality				10		
10		Recreation LMVD				5 10		
11	.31	Supervision & Administration				65		NOTE: Study Costs are included in
12		SUBTOTAL				480		the latest PB for the parent study,
13		Contingencies				120		however, they were not broken out by
14		TOTAL				600		individual item.

DATE PREPARED	DIVISION: Lower Mississippi Valley DISTRICT: New Orleans	REGION: Lower Mississippi BASIN: Coastal Louisiana	Page of

ENG FORM 2204-R, May 82 REPLACES ENG FORM 2204, APP 77 WHICH IS OBSOLETE.

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RCS: DAEN-CWB-12

STUDY COST ESTIMATE (PB-6)
($000)
For use of this form, see ER 11-2-220

APPROPRIATION TITLE: General Investigations
CATEGORY: Surveys
CLASS: Flood Damage Preventions

NAME OF STUDY: Louisiana Coastal. Area, Interim Water Supply Study on Plaquemines Parish
SUBCLASS:

LINE NO.	SUBACCOUNT NUMBER	SUBACCOUNT TITLE	CURRENT COST ESTIMATE: RECON-NOISSANCE PHASE	CURRENT COST ESTIMATE: FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: NON-FEDERAL FEASIBILITY PHASE	CURRENT COST ESTIMATE: TOTAL FEASIBILITY PHASE	PREVIOUS FEDERAL COST ESTIMATE AND DATE APPROVED ( )	REMARKS
	a	b	c	d	e	f	g	h
	.00	Cost through 30 Sep 78				0		Total Study Cost
1	.01	Public Involvement				13		$480,000
	.02	Institutional Studies				3		
2	.03	Social Studies				7		
	.04	Cultural Resources				19		
3	.05	Environmental Quality				56		
	.06	U.S. Fish & Wildlife Service				21		
4	.07	Economic Studies				18		
	.08	Surveys and Mapping				20		
5	.09	Hydrology & Hydraulics				8		
	.10	Foundations & Materials				8		
6	.11	Design & Cost Estimate				30		
	.12	Real Estate				7		
7	.13	Study Management				32		
	.14	Plan Formulation				13		
8	.15	Report Preparation				51		
	.20	Other Studies						
9		Water Quality				8		
		Recreation				9		
10		LMVD				10		
11	.31	Supervision & Administration				52		NOTE: Study Costs are included in
12		SUBTOTAL				385		the latest PB for the parent study,
13		Contingencies				95		however, they were not broken out by individual item.
14		TOTAL				480		

DATE PREPARED:
DIVISION: Lower Mississippi Valley
DISTRICT: New Orleans
REGION: Lower Mississippi
BASIN: Coastal Louisiana
Page of

ENG FORM 2204-R, May 82

REPLACES ENG FORM 2204, APR 77 WHICH IS OBSOLETE.

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LOUISIANA COASTAL AREA, LOUISIANA

INITIAL EVALUATION REPORT

ON

WATER SUPPLY

APPENDIX A

PLANNING AID REPORT

FISH AND WILDLIFE SERVICE

U.S. DEPARTMENT OF THE INTERIOR

United States Department of the Interior

FISH AND WILDLIFE SERVICE

POST OFFICE BOX 4305
103 EAST CYPRESS STREET
LAFAYETTE, LOUISIANA 70502

July 27, 1984

Colonel Robert C. Lee
Commander and District Engineer
U.S. Army Engineer District, New Orleans
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Lee:

Reference is made to the Louisiana Coastal Area Study--Interim Report on Water Supply. The Fish and Wildlife Service has prepared the attached planning-aid report to assist your staff in the preparation of an Initial Evaluation Report for this study. Items discussed in the attached report are based on the Scope of Work for the project received from your agency on October 1, 1983. This report does not fulfill our total responsibilities under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We will continue to work closely with your staff in an effort to develop feasible, ecologically sound measures to reduce water supply problems in coastal Louisiana. Please keep Dr. Thomas Michot of this office advised as the planning of this study progresses.

Your cooperation in this matter is greatly appreciated.

Sincerely yours,

David W. Fruge

David W. Fruge
Field Supervisor

cc: La. Dept. of Natural Resources (CMS), Baton Rouge, LA
La. Dept. of Wildlife and Fisheries, Baton Rouge, LA
NMFS, Galveston, TX
EPA, Dallas, TX
FWS, Atlanta, GA (AHR)

LOUISIANA COASTAL AREA STUDY

INTERIM REPORT ON WATER SUPPLY

PLANNING AID REPORT

SUBMTTED TO

NEW ORLEANS DISTRICT

U.S. ARMY CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

PREPARED BY

THOMAS C. MICHOT, PH. D.

FISH AND WILDLIFE BIOLOGIST

UNDER THE SUPERVISION OF

DAVID W. FRUGE, FIELD SUPERVISOR

U.S. FISH AND WILDLIFE SERVICE

DIVISION OF ECOLOGICAL SERVICES

LAFAYETTE, LOUISIANA

JULY 1984

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INTRODUCTION

The New Orleans District, Corps of Engineers (NODCE), is conducting a reconnaissancestudy of water supply problems as part of the Louisiana Coastal Area Study. The Louisiana Coastal Area Study is being conducted in response to Congressional resolutions adopted in 1967; those resolutions directed the Corps of Engineers to investigate the feasibility of improvements in that area for the purposes of hurricane protection, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and related water resource purposes. The interim report on water supply will identify the causes of land loss and erosion and determine the environmentally and economically feasible solutions that warrant detailed investigation. The study area includes the coastal wetlands in 21 Louisiana parishes that would be inundated by hurricane- induced tidal surges, or roughly lands below the 5-foot elevation contour.

FISH AND WILDLIFF RESOURCES OF THE STUDY AREA

Habitat Descriptions

Marshes

The marshes in the study area have been classified by Chabreck (1972) as fresh, intermediate, brackish, and saline. These marsh types correspond to palustrine emergent wetlands, estuarine emergent oligohaline wetlands, estuarine emergent mesohaline wetlands, and estuarine emergent polyhaline wetlands, respectively, according to Cowardin et al. (1979). Total marsh acreage in the study area is estimated at 2.5 million acres (based on 1978 aerial photographs interpreted by Wicker et al. (1980) and Wicker et al. (1981); see Table 1). Approximately 72 percent of the marshes are located in the eastern half of the study area,known as the Mississippi Deltaic Plain,and 28 percent are in the western portion, or Chenier Plain.

Common vegetation in the fresh marshes of the study area includes bulltongue, sawgrass, maidencane, cattail, smartweed, alligatorweed, spikerush, and deer pea. These marshes are characterized by salinities less than 0.5 parts per thousand (ppt) and are located farthest inland from the Gulf of Mexico. Intermediate marshes are a transitional phase between the fresh and brackish marsh types and have a salinity range of 0.5 to 5.0 ppt. Common species in intermediate marsh include saltmeadow cordgrass, cyperus, bulltongue, southern bulrush and roseau. There are about 1.2 million acres of fresh and intermediate marsh in the study area (Table 1).

Brackish marsh generally occurs between the intermediate and saline marsh types and is characterized by salinities of 5.0 to 18.0 ppt. Common plants in the brackish marsh include saltmeadow cordgrass, Olney's threesquare, leafy threesquare, saltgrass, saltmarsh cordgrass, big cordgrass, and black rush. There are about 900,000 acres of brackish marsh in the study area (Table 1).

Table 1. Baseline acreage by habitat type for the Louisiana Coastal Area, Deltaic Plain and Chenier Plain regions (data from 1978 aerial photographs, modified by NODCE from Wicker et al. 1980 and Wicker et al. 1981).

Habitat Type	Deltaic Plain	Chenier Plain	Total
Forested wetlands	634,300	3,100	637,400
Emergent marsh			
Fresh/intermediate	725,385	458,128	1,183,513
Brackish	690,303	221,061	911,364
Saline	409,907	24,307	434,214
Total marsh	1,825,595	703,496	2,529,091
Open water	4,913,100	629,300	5,542,400
Total	7,372,995	1,335,896	8,708,891

Saline marshes generally occur adjacent to the Gulf of Mexico and its associated large bays and on barrier islands. Salinities range from 18 to 30 ppt and support plant species such as saltmarsh cordgrass, black rush, saltgrass, saltwort, and glasswort. There are approximately 400,000 acres of saline marsh in the study area Table 1).

Wooded Areas

Wooded lands in the study area are of three major types: bottomland hardwoods (seasonally flooded palustrine forested wetlands), wooded swamp (semipermanently flooded palustrine forested wetlands), and palustrine scrub-shrub wetlands. Acreage estimates provided by NODCE were revised from Wicker et al. (1980) and Wicker et al. (1981); those estimates indicate that there are 634,000 acres of forested wetlands in the Deltaic Plain and 3,100 acres of forested wetlands in the Chenier Plain, for a total of 637,400 acres in the study area (Table 1). Other studies have shown acreages that are different from the above figures because of differences in study area boundaries: Bahr et al. (1983) report a total of 537,000 acres of forested wetlands for the Deltaic Plain, and Gosselink et al. (1979) report 16,000 acres of forested wetlands for the Chenier Plain.

The bottomland hardwood habitat type is primarily associated with the relatively higher elevations along natural ridges and floodplains of streams flowing through the study area. This habitat usually floods in winter and spring. Common tree species in bottomland hardwoods include American elm, black willow, water oak, overcup oak, Nuttall oak, swamp chestnut oak, eastern cottonwood, American sycamore, hackberry, red maple, sweetgum, and bitter pecan. There are approximately 114,000 acres of bottomland hardwood habitat in the Deltaic Plain (Bahr et al. 1983).

Wooded swamp habitat occurs at slightly lower elevations than bottomland hardwoods, and hence remains inundated for longer periods of time. Common species include baldcypress, tupelogum, red maple, green ash, buttonbush, water hyacinth, lizard's tail, and duckweed. The Deltaic Plain has approximately 390,000 acres of wooded swamp habitat (Bahr et al. 1983). Scrub-shrub wetlands are dominated by woody vegetation less than 20 feet in height, primarily wax myrtle. Other species commonly found in the scrub-shrub areas include spikerush, bulltongue, marsh fern, pennywort, buttonbush, red maple, and alligatorweed. There are about 33,000 acres of scrub-shrub habitat in the Deltaic Plain (Bahr et al. 1983).

Open Water Areas

NODCE data (Table 1) show a total of 5.5 million acres of open water in coastal Louisiana. These were classified by Chabreck (1972) as ponds and lakes (lacustrine open water; 43 percent), bays and sounds (estuarine open water; 53 percent), bayous and rivers (riverine open water; three percent) and canals and ditches (excavated riverine open water; one percent). A small percentage of these open water areas are vegetated with submersed and/or floating aquatics such as coontail, widgeongrass, pondweed, watermilfoil, southern naiad, fanwort, white waterlily, duckweed, American lotus, and water hyacinth.

Uplands

Louisiana's coastal region also includes approximately 1 million acres of active beaches, cheniers, spoil deposits, ridges, salt domes, and elevated bayou and lake banks (Chabreck 1972). These areas are vegetated with various species, including live oak, native pecan, sycamore, sweetgum, water oak, baccharis, and black willow.

Fishery Resources

The sport and commercial fishery resources of the Louisiana coastal area are of great economic and recreational importance, and are primarily estuarine and marine in nature. Freshwater sportfishing is generally limited to the upper reaches of coastal rivers and to oil and gas access canals and freshwater lakes and ponds. Primary game species harvested in freshwater include largemouth bass, yellow bass, black crappie, white crappie, bluegill, spotted sunfish, redear sunfish, warmouth, channel catfish, flathead catfish, and blue catfish. Important freshwater commercial fishes include blue catfish, channel catfish, flathead catfish, yellow bullhead, bowfin, carp, gars, and buffaloes.

The Louisiana coastal region provides prime habitat to a variety of estuarine finfishes and shellfishes because of the large quantity of tidal marshes, submersed aquatic beds, and shallow estuarine waters present in the study area. Some of the species are permanent residents of the coastal marshes, while others are only present during their early life stages. The latter species utilize the highly productive low to moderate salinity portions of the study area as nursery areas and move to more saline waters as they mature. Some of the more common estuarine/marine species are listed in Table 2; many of those species are valuable from both the recreational and commercial standpoints.

Louisiana leads the nation in commercial fishery harvest tonnage virtually every year; in harvest value, Louisiana was third (behind Alaska and Massachusetts) in 1983. That year, Louisiana commercial fishermen harvested 1.8 billion pounds valued at$230 million (ex-vessel prices; National Marine Fisheries Service (NMFS) 1984). Gulf menhaden ranked first in tonnage harvested in Louisiana in 1981 with 1.1 billion pounds (89 percent of the total catch), and second in value. Shrimp (brown, white, and pink) ranked first in value and second in tonnage. Oyster meats ranked third in value and fourth in tonnage, while hard-shelled crabs ranked third in tonnage and fourth in value (Becker 1983).

Recreational fishing in the study area is also of substantial economic value. The Louisiana Department of Wildlife and Fisheries (LDWF) estimated the value of marine and freshwater recreational fishing in Louisiana in 1978 at$467 million; commercial fishery retail sales for the same year were valued at$384 million(Becker 1983). Gosselink et al. (1979) estimated the potential sportfishing demand in the Louisiana coastal region to be 10.8 million man-days per year.

Table 2. A list of common estuarine and marine fishes and shellfishes of commercial or recreational importance in the study area.

Species	
Bull shark	Sheepshead
Blacktip shark	Silver perch
Tiger shark	Sand seatrout
Lemon shark	Spotted seatrout
Atlantic sharpnose shark	Spot
Scalloped hammerhead	Southern kingfish
Tarpon	Gulf kingfish
Gulf menhaden	Atlantic croaker
Atlantic thread herring	Black drum
Blue catfish	Red drum
Gafftopsail catfish	Atlantic spadefish
Sea catfish	Striped mullet
Gulf killifish	Great barracuda
Rock hind; calico grouper	Little tuna; bonito
Bluefish	King mackerel
Cobia	Spanish mackerel
Blue runner	Southern flounder
Crevalle jack	American oyster
Greater amberjack	Rangia clam
Florida pompano	White shrimp
Dolphin	Brown shrimp
Red snapper	Pink shrimp
Gray snapper	Seabob
Vermilion snapper	Blue crab
Tripletail	

Louisiana sport fishermen made an estimated 3 million saltwater fishing trips in 1979 (NMFS 1980a).

Recent studies have shown that estuarine-dependent fisheries production is closely linked with the total marsh acreage in the associated estuarine drainage area. The marshes serve as the primary source of organic detritus which supports the estuarine food chain. The marshes and associated shallow waters are also extremely important as nursery areas for many estuarine species of finfish and shellfish. Based on an extensive review of available information, we believe that total estuarine-dependent commercial fisheries production in Louisiana has peaked and will decline in proportion to the acreage of marshland loss.

Wildlife Resources

The recreational and commercial value of wildlife resources in Louisiana is substantial. An estimated 2.9 million man-days per year are spent on hunting and nonconsumptive wildlife-oriented recreation in the Louisiana coastal region (Gosselink et al. 1979). In addition, 4.4 million pelts valued at $18 millionwere taken by Louisiana fur trappers in 1980-81, and 16,300 alligators worth $1.7 million were harvested in the state in 1979 (LDWF data). The vast majority of the fur and alligator harvest in the state is from the coastal marshes.

Birds

More than 400 species of birds are known to occur in Louisiana, most of them occurring in the coastal region. The coastal marshes are of primary importance to migratory waterfowl; approximately 4 million ducks and 400,000 geese winter there (U.S. Fish and Wildlife Service (USFWS) 1982).

About 90 percent of the geese that winter in Louisiana are lesser snow geese(both blue and white color phases) and 9.8 percent are white-fronted geese. One to five thousand Canada geese also winter in these wetlands.

Approximately 92 percent of Louisiana's wintering duck population consists of dabblers, the major species being gadwall, green-winged teal, blue-winged teal, northern shoveler, mottled duck,northern pintail, American wigeon, and mallard. Louisiana's gadwall population represents about 80 percent of the continental population for that species (USFWS 1982). Diving ducks comprise approximately eight percent of Louisiana's duck population. Lesser scaup is the predominant diving duck in coastal Louisiana; about 255,000 (81 percent of the divers) winter in the coastal marshes and another 500,000 to 1 million winter off the Louisiana coast. Other important divers include ring-necked duck, canvasback, redhead, and ruddy duck (USFWS 1982).

The Louisiana coastal region serves waterfowl not only as a wintering area; it also supports many spring and fall transients en route to their northern breeding grounds and their Central and South American wintering grounds. In addition, three species of ducks nest and rear

their broods in coastal Louisiana. Five to eight thousand fulvous whistling ducks are summer residents of Louisiana. This species nests outside of the study area in the rice fields of southwest Louisiana, but it uses the coastal marshes as staging areas during fall migration to Mexico and on returning from there in the spring (Bellrose 1976). Louisiana has a breeding population of about 30,000 wood ducks,many of which nest in the forested wetlands of the study area. The coastal marshes also suppoort a breeding population of about 50,000 mottled ducks,which represents about half of the continental population (Bellrose 1976). Many more individuals of the latter two species also winter in Louisiana.

Some of the major waterfowl concentration areas in the Louisiana coastal area are shown in Figure 1. High concentrations also occur on the Federal and State wildlife areas in the coastal region. The marshes of the study area support more than two-thirds of the Mississippi Flyway waterfowl population (Bellrose 1976). During the 1979-80 season, more than 500,000 man-days were spent on waterfowl hunting in coastal Louisiana and 1.5 million ducks were bagged (LDWF 1980).

The study area provides important habitat for numerous other resident and migratory birds. Important game species include American coot, clapper rail, king rail, sora, common moorhen, purple gallinule, American woodcock, and common snipe. Hunting of these species in coastal Louisiana accounts for 38,000 man-days per year of recreation (Gosselink et al. 1979).

Hundreds of nongame species of birds inhabit the study area. Twenty-eight species of seabirds and wading birds are known to have established nesting colonies in the study area (Portnoy 1977; Keller et al. 1984); these species are listed in Table 3. In 1984 there were 188 active bird colonies in coastal Louisiana (Keller et al. 1984); the locations of the colonies are shown in Figure 2. Other common waterbirds which are not colonial nesters in Louisiana include the least bittern, woodstork, American white pelican, pied-billed grebe, magnificent frigatebird, black-necked stilt, American avocet, killdeer, black-bellied plover, willet, and various sandpipers, gulls, and terns (Lowery 1974a).

The coastal wetlands support many species of resident and transient hawks and owls. Permanent residents include red-shouldered hawk, black vulture, turkey vulture, barn owl, common screech owl, great horned owl, and barred owl. The red-tailed hawk, marsh hawk, and American kestrel are winter residents and the Mississippi kite and broad-winged hawk are common summer residents (Lowery 1974a).

The Louisiana coastal area supports many species of passerines and other small birds. Trans-Gulf migrants from Central and South America fly due north from the Yucatan peninsula in Mexico to the Louisiana coast in the spring. The state's coastal wetlands and associated forested ridges serve as valuable stopover points after the nonstop flights across the Gulf. Likewise, the area serves as an important staging area for these species in the fall. This is true for transient species enroute to and from their breeding grounds to the

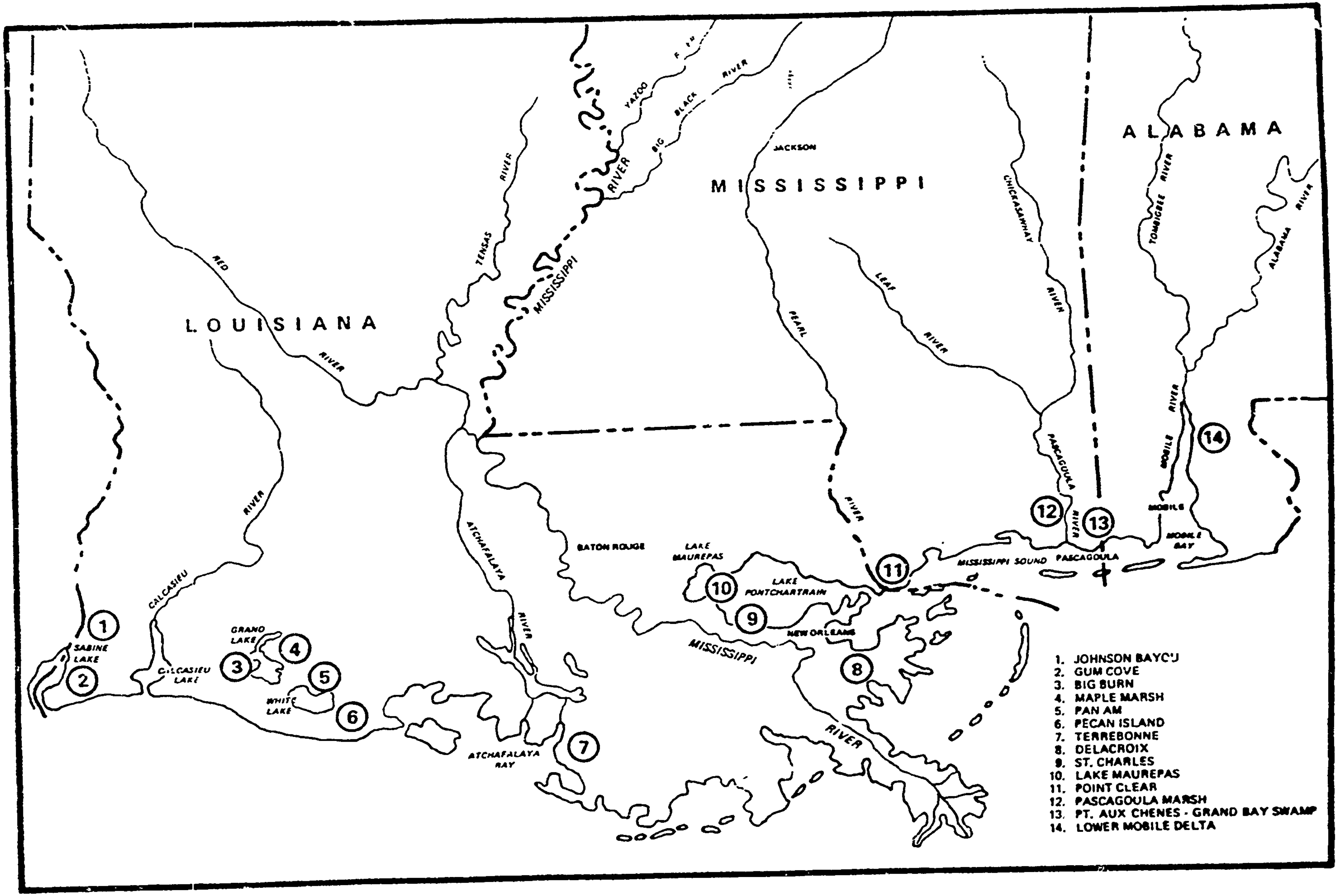


Figure 1. Key waterfowl wintering areas along the Central Gulf Coast, as identified by USFWS (1982).

Table 3. Species of birds for which colonies were censused in coastal Louisiana by Portnoy (1977) and/or Keller et al. (1984).

Species	
Brown pelican	Glossy ibis
Olivaceous cormorant	White ibis
Anhinga	Roseate spoonbill
Great blue heron	Laughing gull
Great egret	Gull-billed tern
Snowy egret	Forster's tern
Reddish egret	Common tern
Cattle egret	Sooty tern
Tricolored heron	Least tern
Little blue heron	Sandwich tern
Black-crowned night heron	Caspian tern
Yellow-crowned night heron	Royal tern
Green-backed heron	Black skimmer
White-faced ibis	American oyst[illegible]

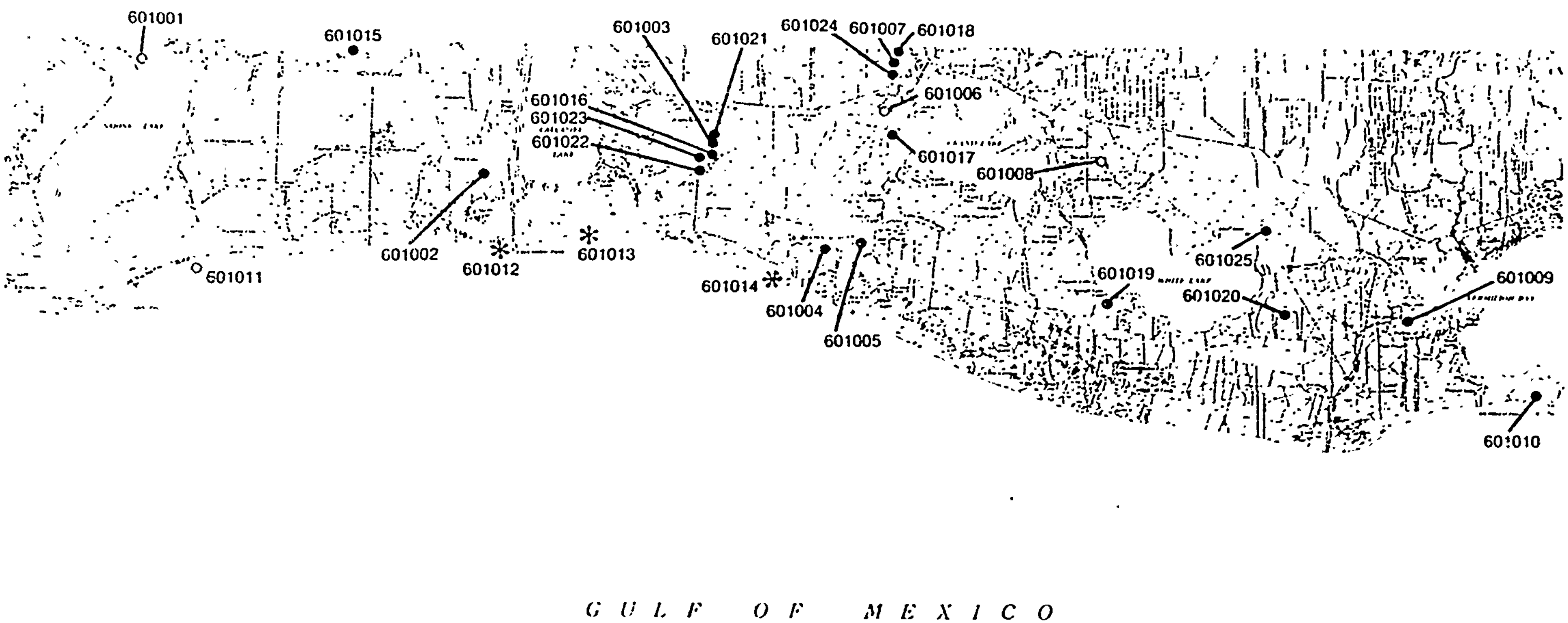
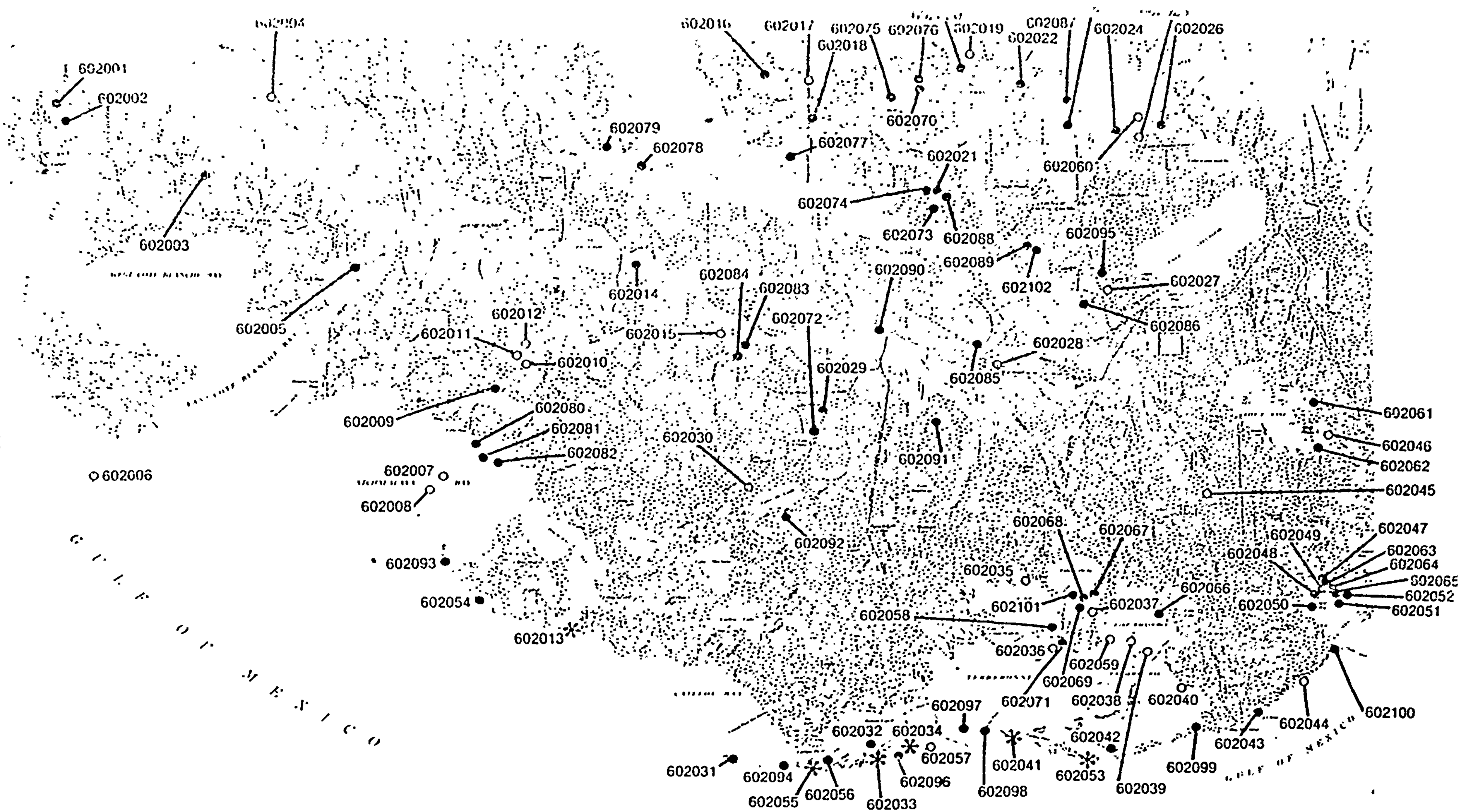


Figure 2. Locations of bird colonies, in the Louisiana coastal area, censused by Keller et al. (1984); • = colonies active in 1983; o = colonies active historically (Portnoy 1977) but inactive in 1983; * = historic least tern colonies (could not be verified in 1983); reference numbers are from Keller et al. (1984).



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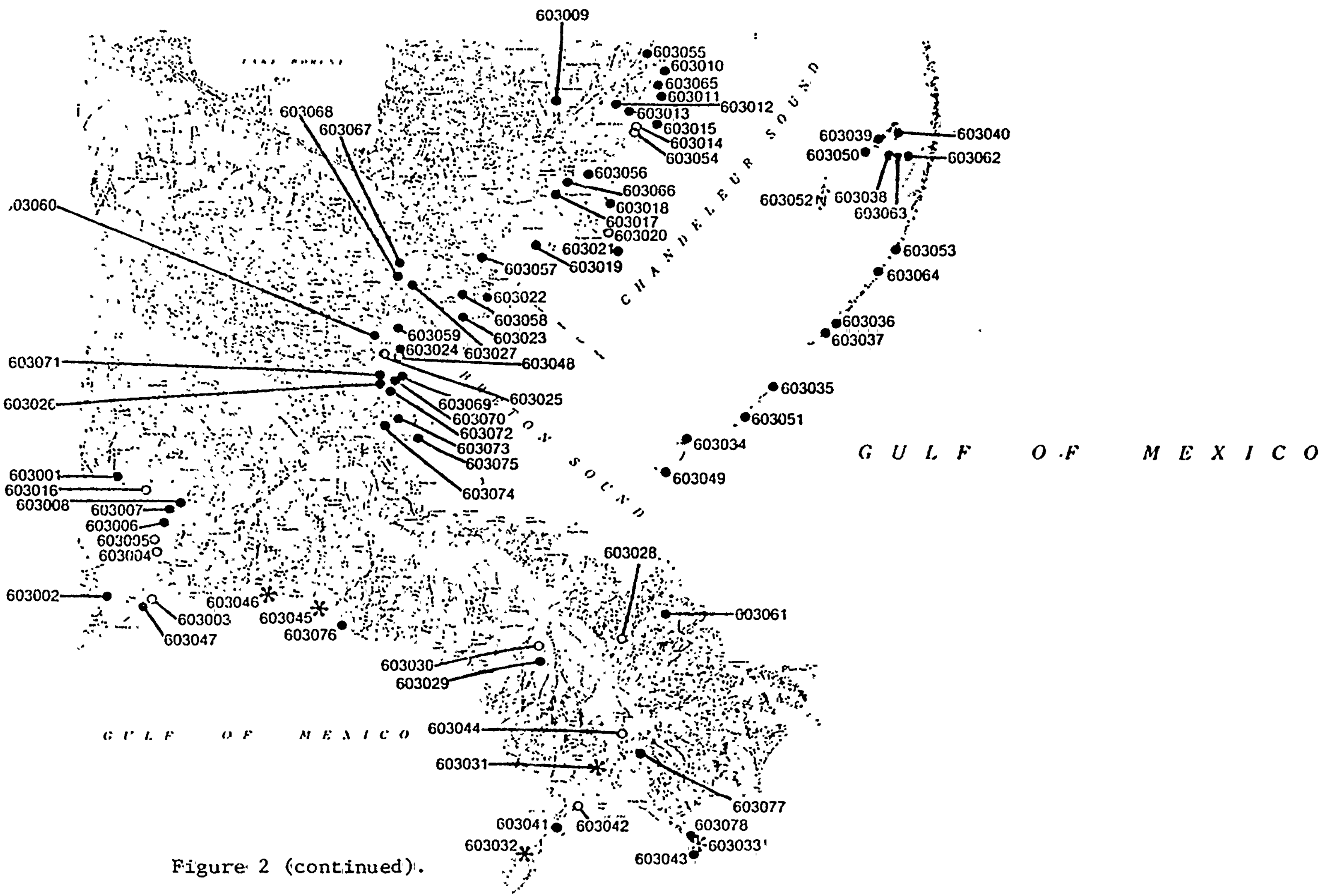

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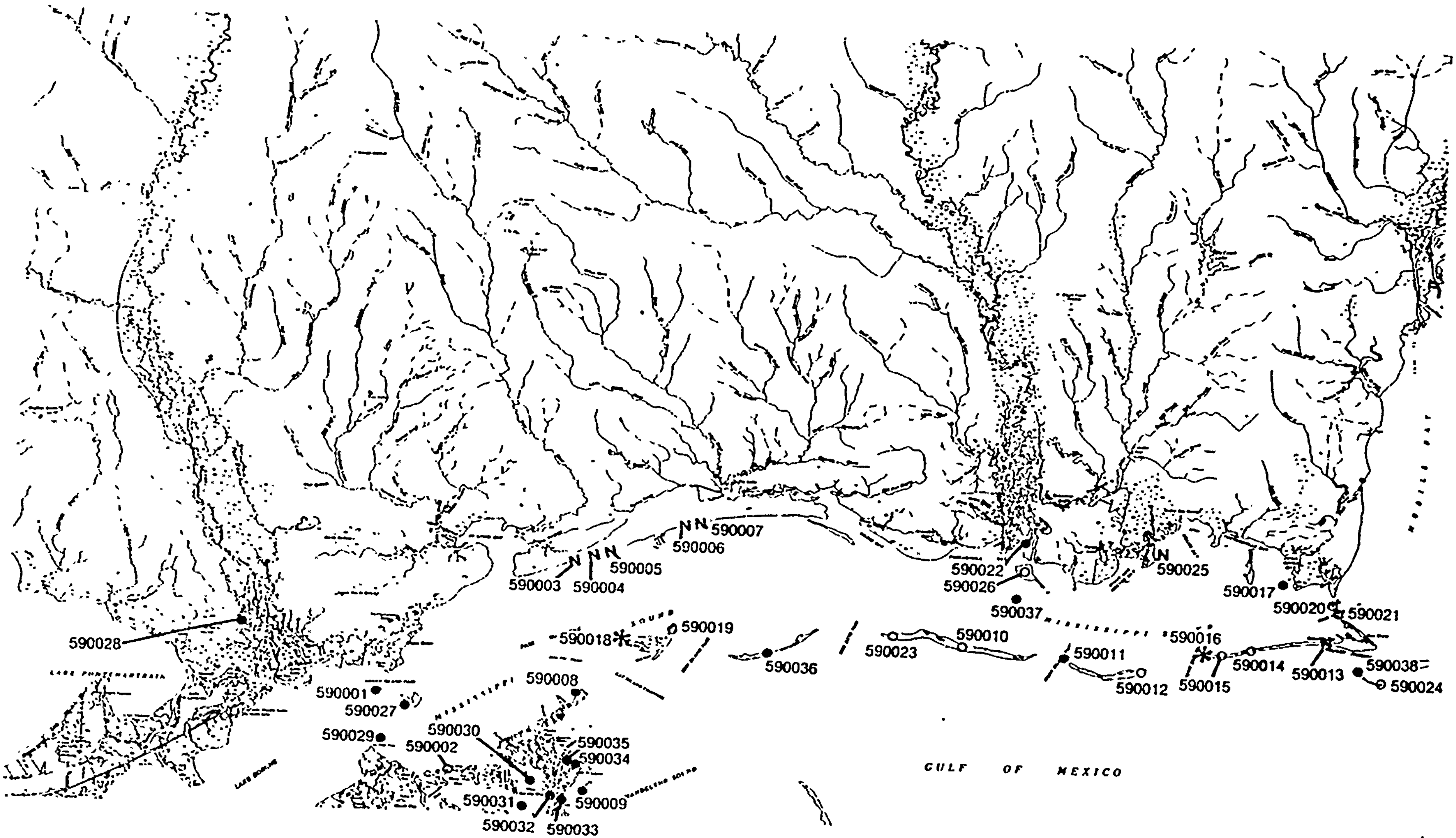

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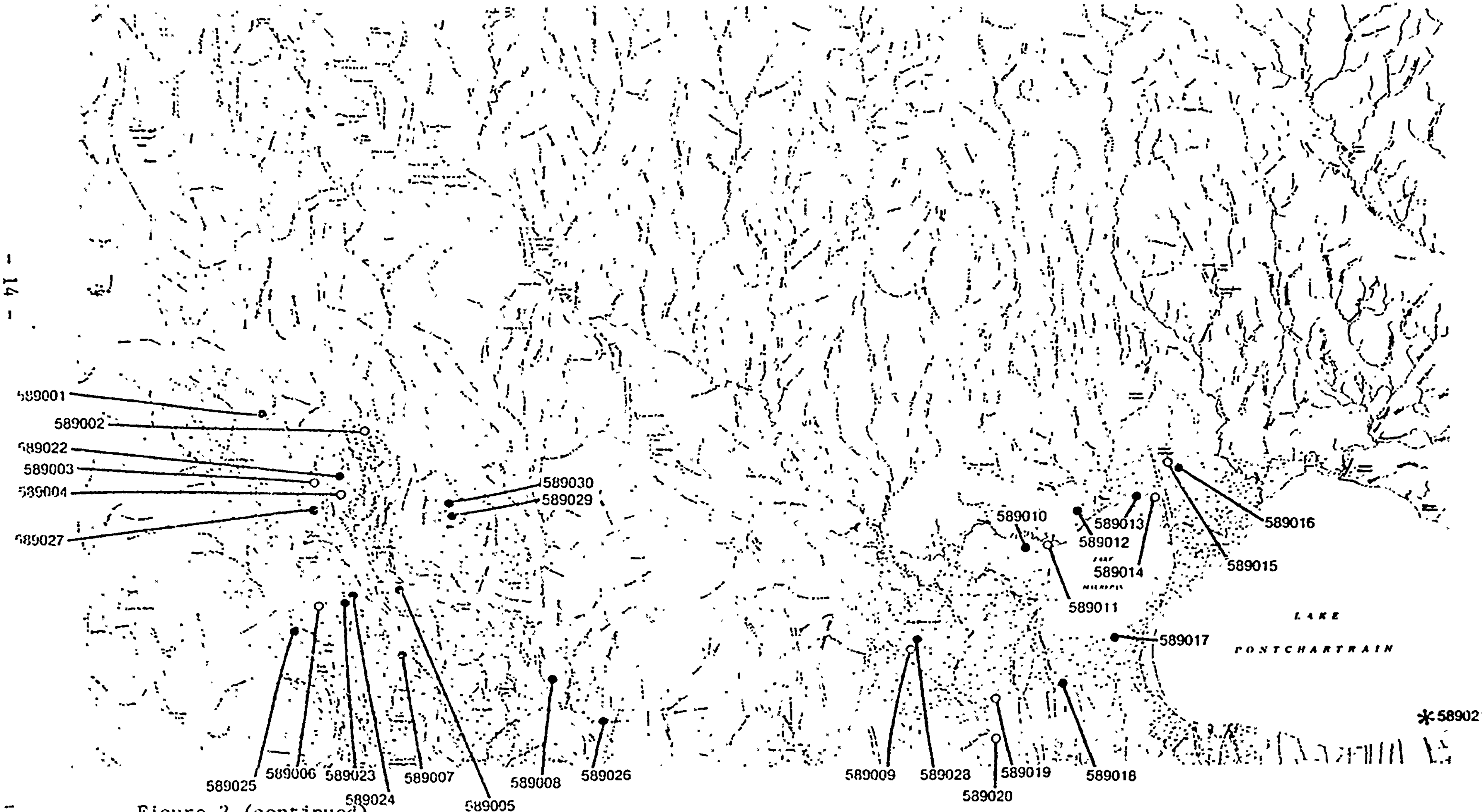

Figure 2 (continued).

north, as well as for species which nest in coastal Louisiana and winter farther south. Included are about 180 species of passerines and a few species of cuckoos, swifts, hummingbirds and goatsuckers. The belted kingfisher and several species of woodpeckers are residents of the study area as well(Lowery 1974a).

Mammals

Louisiana has 58 species of land mammals (Lowery 1974b); many of those reside in the coastal marshes and are of economic importance as game or furbearers. Important game mammals in the study area include white-tailed deer, eastern cottontail, swamp rabbit, gray squirrel, fox squirrel, and raccoon. Important furbearers are muskrat, nutria, raccoon, mink, opossum, skunk, bobcat, beaver, and coyote. Other land mammals found on the study area include various species of insectivores, bats, and rodents, and the nine-banded armadillo. Numerous species of whales and dolphins inhabit the Gulf waters adjacent to the study area; some occasionally enter estuarine areas.

The white-tailed deer, the primary big game mammal in the study area, is chiefly associated with forested wetlands; significant populations also occur in fresh to brackish marshes, especially when higher ground is located nearby. The LDWF has estimated that, in Louisiana's coastal region, deer hunters spent 346,600 man-days and harvested 13,100 deer during the 1980-81 season.

The eastern cottontail is most frequently found on higher ground (levees, agricultural lands, etc.) adjacent to the wetlands of the study area, whereas the swamp rabbit usually inhabits the forested wetlands and fresh to brackish marshes. LDWF estimated that 298,000 man-days were spent on rabbit hunting in the coastal parishes in 1977-78, with 544,000 rabbits being harvested.

Both the gray and fox squirrels occur in the forested wetlands of the study area. Approximately 196,000 man-days of squirrel hunting in the coastal parishes resulted in a harvest of 343,000 squirrels in 1977-78 (LDWF data).

The northern raccoon is a game animal as well as a commercially important furbearer. The raccoon that inhabits the coastal marshes is a different subspecies from the one in the rest of the state (Lowery 1974b). In 1981-82, 73,000 raccoons were trapped in coastal Louisiana for a value of $524,000 (LDWF records). This species ranks third in numbers harvested, behind nutria and muskrat, although its value may exceed that of the muskrat (as it did in 1981-82).

The muskrat was the most important furbearer in the state, on a commercial basis, until 1961-62, when the take of that species was surpassed by that of the nutria; the nutria has retained this status through the present. Both species are common in forested wetlands but reach their highest densities in the marshes. The nutria reaches highest densities in fresh marshes and the muskrat in brackish marshes, although both species have been known to reach substantial densities in other marsh types and they often occur together. The 1981-82 nutria harvest was 961,000 pelts, worth $4.2 million, while

the muskrat take was 387,000 pelts, worth $1.0 million. Annual harvest of these two species fluctuates depending on market prices as well as population densities. The highest catch for either species during the period of record (1913 to present) was 8.3 million muskrat pelts harvested in 1945-46 (Lowery 1974b).

The North American mink and nearctic river otter are abundant in the forested and marsh habitats of the study area. In the 1981-82 trapping season, 32,000 mink and 6,000 otter were harvested in the state, for values of $385,000 and $130,000, respectively. Approximately 80 percent of the state's otter harvest is from the coastal area (O'Neil and Linscombe 1976). The Virginia opossum, coyote, striped skunk, and bobcat are primarily associated with the bottomland hardwood and wooded swamp habitats in the study area.

Amphibians and Reptiles

Amphibians are generally restricted to the freshwater marshes, ponds, stream and lake margins, and forested wetlands of the study area. The bullfrog and pig frog are important from a commercial and recreational standpoint. Other representative amphibians include lesser siren, three-toed amphiuma, Gulf Coast toad, Fowler's toad, green treefrog, spring peeper, cricket frog, eastern narrow-mouthed toad, and bronze frog.

Commercially important reptiles occurring in the marshes and swamps include the American alligator, common snapping turtle, alligator snapping turtle, smooth softshell turtle, spiny softshell turtle, and diamondback terrapin. In 1979, 16,300 alligators were harvested in Louisiana (predominantly from the coastal region) for a value of $1.7 million.

Other reptiles common in the palustrine habitats include red-eared turtle, painted turtle, stinkpot, Mississippi mud turtle, green anole, broad-headed skink, diamondback water snake, broad-banded water snake, green water snake, Gulf salt marsh snake, western ribbon snake, speckled kingsnake, and western cottonmouth. The Gulf salt marsh snake and diamondback terrapin are common in the brackish to saline marshes as well.

Endangered and Threatened Species

Several endangered species are found in the study area. Endangered birds known to occur in the area include the bald eagle and brown pelican; the threatened arctic peregrine falcon is also a seasonal visitor to the area. Approximately fourteen bald eagle nesting territories are known to be located in the study area; the coastal forests and marshes serve as feeding areas for the breeding birds as well as occasional wintering eagles. Approximately 500 resident brown pelican nests are located on Queen Bess Island in the lower Barataria Basin and on the North Islands in Chandeleur Sound; the pelicans feed in estuarine waters adjacent to these islands.

Other endangered birds that may occur in the study area include the ivory-billed woodpecker, Bachman's warbler, and the Eskimo curlew.

Endangered land mammals that may occur on the area include the Florida panther and the red wolf. There have been reported sightings for some of these species in recent years, but none have been confirmed. Endangered marine vertebrates which may venture into the nearshore waters and/or beaches of the study area include the blue, finback, humpback, sei, and sperm whales and the hawksbill, Kemp's ridley, and leatherback sea turtles; the threatened green and loggerhead sea turtles may be found in the study area as well.

Species of Special Emphasis

The study area supports 18 species considered by the FWS to be National Species of Special Emphasis (Federal Register, Vol. 48, No. 237, December 8, 1983). These species are coyote, brown pelican, white-fronted goose, snow goose, Canada goose, wood duck, black duck, mallard, pintail, canvasback, ring-necked duck, osprey, bald eagle, peregrine falcon, American woodcock, eastern least tern, mourning dove, and American alligator. Also present in the study area are 35 species highlighted by the FWS's Regional Resource Plan for the Southeast Region; these include coyote, brown pelican, white-fronted goose, Canada goose, snow goose, wood duck, mallard, black duck, mottled duck, redhead, canvasback, ring-necked duck, osprey, bald eagle, peregrine falcon, clapper rail, wood stork, American woodcock, least tern, mourning dove, red-headed woodpecker, pileated woodpecker, starling, common grackle, brown-headed cowbird, red-winged blackbird, eastern bluebird, seaside sparrow, American alligator, loggerhead turtle, green turtle, leatherback turtle, hawksbill turtle, striped bass, and Atlantic sturgeon.

Public Wildlife Areas

National Wildlife Refuges (NWR's) in the study area include Breton NWR (including Breton National Wilderness Area), Delta NWR, Shell Keys NWR, Lacassine NWR, and Sabine NWR. The study area also includes Jean Lafitte National Historical Park.

State Wildlife Management Areas (WMA's) in the study area include Biloxi, Bohemia, Manchac, Salvador, Pass a Loutre, Wisner, Atchafalaya Delta, Pearl River, Joyce, and Pointe au Chien WMA's. In addition, the state manages St. Tammany Wildlife Refuge, Marsh Island Wildlife Refuge and Game Preserve (WRGP), Louisiana State WRGP, and Rockefeller WRGP.

FISH- AND WILDLIFE-RELATED PROBLEMS AND OPPORTUNITIES

Most of the water supply problems and opportunities being addressed by NODCE are municipal, industrial, and/or agricultural in nature. However, there are some water supply problems in the study area that are directly related to fish and wildlife, and the present study provides an opportunity to address those problems.

Probably the greatest and most extensive water supply problem in coastal Louisiana is the lack of adequate freshwater inflow into the

coastal marshes. This decrease was brought about by navigation and flood control projects on the Mississippi River and other waterways. The lack of adequate fresh water results in saltwater intrusion, subsidence, and marsh deterioration. These problems and some possible solutions are being addressed under a different aspect of the Louisiana Coastal Area Study, i.e., the Interim Report on Land Loss and Marsh Creation. The USFWS planning-aid report for that project (transmitted to NODCE June 18, 1984) thoroughly discusses those issues. However, we feel that the problem of inadequate freshwater inflow to the coastal marshes is a legitimate aspect of the water supply study as well and should be addressed in the Initial Evaluation Report.

One additional fish- and wildlife-related problem associated with water supply is the water situation in the Mermentau River Basin of southwest Louisiana. The marshes in that area are being stressed by excessive inundation due to the inability of existing control structures to allow adequate freshwater discharge from the basin, presently being used as a rice irrigation reservoir. At the same time, marshes in the adjacent Calcasieu and Chenier basins are deteriorating due to a lack of fresh water inflow (U.S Army Corps of Engineers 1983a). Measures to increase freshwater discharges from the Mermentau Basin into the Calcasieu and Chenier Basins would alleviate problems in all three areas.

SIGNIFICANT DATA GAPS

The Mermentau Basin has been identified by NODCE as having water supply problems. According to NODCE, the projected demand for water will exceed the supply by the year 2020 such that additional sources will be required. The projected demand is apparently based on projected increases in irrigation needs for rice production. However, since many of the major irrigation canal companies have discontinued operation, it appears that the problem there may be one of irrigation water distribution rather than water supply. In addition, many farmers have increased their use of ground water for rice irrigation, and/or have converted substantial rice acreage to other crops (primarily soybeans). The Louisiana Department of Transportation and Development (1984) estimated that water supply in the Calcasieu-Mermentau Basins (1,904 million gallons/day, or MGD) would be adequate to meet the projected demand through the year 2020 (1,504 MGD). We feel that the water supply and land-use situation in the Mermentau Basin should be studied thoroughly before any detailed plans to increase water supply are proposed for that area.

MANAGEMENT MEASURES TO ADDRESS PROBLEMS AND OPPORTUNITIES

NODCE has identified six water supply problem areas in the study area; 27 proposed plans were formulated as possible solutions to the identified problems. The six problem areas and their respective plans are as follows:

1) Saltwater contamination of surface and ground water supplies in the vicinity of Grand Isle (Plans 1-5);

2) Saltwater contamination of ground and surface water sources in the Houma area during storm surges and dry periods with sustained southerly winds (Plans 6-9);

3) Saltwater contamination of public water supplies in Plaquemines Parish during low flow conditions on the Mississippi River (Plans 10-12);

4) The lack of an emergency water supply source for the river parishes for use in the event of contamination of Mississippi River water (Plans 13-17);

5) Saltwater contamination of surface and ground water supplies in the Cameron-Holly Beach area (Plans 19-23);

6) Inadequate ground and surface water supplies in the Mermentau Basin to meet projected irrigation needs (Plans 24-27).

These problem areas and our preliminary assessment of the impacts of the proposed plans on fish and wildlife resources are discussed below.

Grand Isle

Plan 1 consists of replacing the existing 8-inch pipeline from Leeville to Grand Isle with a 12-inch pipeline to upgrade existing supplies. Although temporary construction impacts may be significant, long-term impacts would be minimized if the pipeline ditch were backfilled immediately after installation.

Plan 2 would provide for desalination of sea water from Bay des Ilettes; intake velocities should not exceed 0.5 ft/sec to avoid entrainment or impingement of small fishes and invertebrates on the intake screens. Plan 3 involves desalination of brackish groundwater supplies. This plan would have minimal impacts on fish and wildlife resources.

Plan 4, the treatment and reuse of waste water, was eliminated by NODCE due to the lack of a central wastewater collection system. Plan 5, the barging of water during periods of high demand, would have minimal impact to fish and wildlife resources.

Houma area

Plan 6 consists of a navigable saltwater barrier on the Houma Navigation Canal. This plan would have extensive positive impacts to fish and wildlife resources. Beneficial effects associated with such a structure are based on the reduction of marsh loss due to saltwater intrusion, and retardation of ongoing conversion of fresher marshes to more saline marsh types. Although the NODCE proposal locates the structure at mile 25, beneficial effects could be maximized if it were located south of the Falgout Canal, which also ser es as an avenue for

saltwater intrusion. The structure should be designed to allow ingress and egress of estuarine organisms. Any negative construction-related impacts would be small in relation to the positive impacts associated with such a structure. This alternative was also recommended by FWS in its planning-aid report to NODCE on the Land Loss and Marsh Creation facet of the Louisiana Coastal Area Study (USFWS 1984).

Plan 7 involves piping water from Bayou LaFourche during periods of saltwater intrusion in the Houma area. The proposed alignment would impact approximately 16 acres of fresh marsh and 8 acres of forested wetlands, both of which serve as valuable fish and wildlife habitat. An alignment that avoids those wetland types would be preferable. More detailed studies would be required to assess the impact of the diversions on water bodies and marshes along Bayou Lafourche, which could conceivably experience localized increases in salinity.

Plan 8 provides for the piping of groundwater from northern Assumption Parish. Adverse impacts of such a plan on fish and wildlife resources would be minimal.

Plan 9 consists of the use of an existing pond, located at the site of the Southdown Sugar Mill near Houma, to store fresh water from the Gulf Intracoastal Waterway for use during high salinity periods. Some dredging would be required to deepen the pond, and the dredged material disposal would impact six acres of marsh.

Plaquemines Parish

Plan 10 involves piping Mississippi River water from mile 116 to East and West Pointe a la Hache and Boothville. Impacts to fish and wildlife resources would be minimal with this plan. Plan 11, the pumping of groundwater from one aquifer to the surface and storing it in another aquifer, also would have minimal effects on fish and wildlife resources.

Plan 12 consists of construction of two leveed reservoirs, one at East Pointe a la Hache (15 feet deep) and one at Boothville (12 feet deep), for storage of untreated fresh water. Potential damages to fish and wildlife habitat associated with both sites would be significant. Approximately 31 acres of brackish marsh would be destroyed at East Pointe a la Hache and 103 acres of intermediate marsh would be impacted at Boothville. The latter area is in existing marsh and/or future marsh creation sites associated with the New Orleans to Venice Hurricane Protection Project. If the depth of the reservoirs could be kept to a maximum of approximately four feet, so that the growth of aquatic vegetation would be encouraged, they would be beneficial to waterfowl and alligators by serving as fresh marsh impoundments. Otherwise, FWS would favor upland reservoir sites to minimize fish and wildlife impacts.

River Parishes

Plans 13 and 14 deal with the construction of reservoirs at the Davis Pond and Big Mar freshwater diversion sites, respectively. These plans would have substantial impacts on fish and wildlife resources

via the loss of 7,425 and 9,200 acres, respectively, of marsh and shallow open water habitats to levees and impoundment. The Davis Pond site is presently about 50 percent fresh marsh and 50 percent open water; a four-square-mile delta is expected to form in the predominantly open water area at the mouth of the Mississippi River outflow channel. The Big Mar site (comprised of the Big Mar and adjacent tidal marshes) is presently about 30 percent open water and 70 percent intermediate marsh. If the reservoirs could be maintained at depths of 1.3 to 3.0 feet, as proposed, aquatic vegetation would establish and the resulting fresh marsh impoundment would benefit waterfowl and alligators. However, the impounded areas would be lost as nursery areas for estuarine fish species unless the control structures were operated to allow ingress and egress. In addition, such dual use of the diversion sites may lead to conflicts between the two uses at certain times, e.g., communities desiring to use the site for water supply may apply pressures to the operating agency to cause a delay or postponement of freshwater releases into the marshes. There also may be hydrological impacts on the operation of the diversion structures. A less-damaging alternative would be the use of upland sites for reservoirs.

Plan 15 calls for the construction of a navigable saltwater barrier in Pass Manchac that would allow Lake Maurepas to be used as a freshwater reservoir. The water would be distributed to communities along the river via pipelines. Direct construction impacts would be minimal. Indirect impacts would include the freshening of Lake Maurepas and the possible severe reduction of movement by estuarine organisms through Pass Manchac; water level reductions in the lake and adjacent wetlands could occur during peak withdrawal of freshwater. The freshening of Lake Maurepas would likely be beneficial to the palustrine wetlands (mostly forested) bordering the lake. Structural modifications to allow ingress and egress of estuarine organisms would have to be incorporated into the design of the saltwater barrier. The actual impacts of water withdrawals from Lake Maurapas on fish and wildlife would depend on the magnitude and timing of those withdrawals.

Plan 16 involves the withdrawal of water from the Mississippi River at mile 225, just south of Baton Rouge and piping the water to downstream communities during emergency situations. Adverse impacts would include alteration of some forested habitat along the pipeline right-of-way. The acreage of woodlands to be affected is not known at this time; efforts should be made to find a route that minimizes adverse impacts on wetlands and other valuable fish and wildlife habitats.

Plan 17 consists of the pumping of ground water from various sources into an underground aquifer in the river parishes. Exact site locations have not yet been determined. Possible adverse impacts deal with potential lowering of the water table in the areas overlying the groundwater sources to be used to supply the underground aquifer; such lowering may affect associated surface vegetation via a change in soil moisture and/or saltwater intrusion into the aquifer.

Plan 18 involves the use of ground water piped from about 50 wells northwest of Lake Pontchartrain. The locations of the wells and

pipelines were not provided, and the type of storage system is unknown. More information is needed to adequately address the impacts of this plan; general impacts associated with pipelines and ground water removal; as discussed previously, would apply here.

Cameron - Holly Beach Area

Plan 19 would transport water, via pipeline, from the Lake Charles municipal water system to Holly Beach and Cameron; the alignment would follow La. Highway 27 adjacent to the west and south shores of Calcasieu Lake. The pipeline would impact 108 acres of brackish marsh; however, since the pipeline ditch would be backfilled, these impacts should be temporary in nature. A portion of the pipeline right-of-way would be located adjacent to Sabine NWR, thus necessitating coordination with the Refuge Manager there.

Plan 20 involves piping untreated fresh water from the Gulf Intracoastal Waterway at Gibbstown, along Louisiana Highway 27 to the existing treatment facilities at Cameron and Holly Beach. Primary impacts to fish and wildlife resources would be the degradation of 126 acres of brackish marsh from construction activities. A less-damaging alternative would be to use the existing borrow ditch adjacent to the highway as a conveyance channel, using water control structures to regulate the interchange between that channel and adjacent brackish waters.

Plan 21 utilizes the existing brackish groundwater source in conjunction with a proposed desalination plant. Construction of the plant will require 42 acres, but the habitat type is unknown since a specific site has not been proposed. An upland site would minimize impacts to fish and wildlife resources. Potential adverse impacts to coastal waters could occur from chemical spills or discharge. Chemicals used in the desalination process include sulfuric acid, polymers and coagulants, sodium hexametaphosphate, citric acid, and brine. Since these materials must be stored onsite, the potential for contamination via chemical spill exists. Precautionary measures should be taken to minimize that risk. Thermal and chemical pollution from the effluent may also have a negative effect on the aquatic community; these impacts could be minimized by proper treatment.

Plan 22 consists of the withdrawal of groundwater from the Chicot Aquifer near Hackberry, Louisiana, and the piping of that water to a storage tank near Cameron-Holly Beach. The pipeline right-of-way would impact 73 acres of brackish marsh and 24 acres of lake and stream bottom; these impacts would apparently be temporary. Pipeline alignment follows Louisiana Highway 27 and passes adjacent to Sabine NWR; coordination with the Refuge Manager would be necessary.

Plan 23 involves the collection and purification of wastewater for reuse. Impacts to fish and wildlife resources associated with this plan would be minimal.

An alternative not considered by NODCE for the Cameron-Holly Beach area would be construction of a saltwater barrier on the Calcasieu Ship Channel, south of Calcasieu Lake; this measure, in combination

with increased freshwater inflow into the Calcasieu Basin (from Mermentau and/or Sabine Basins), would allow the use of freshwater from above the barrier as a water supply. Such a plan may also lessen the amount of saltwater intrusion into the existing groundwater supply, the Chicot Aquifer. In addition, numerous benefits to fish and wildlife resources in the Calcasieu Basin would occur (USFWS 1984). However, the details of such a plan would have to be carefully assessed with respect to impacts on marine fishery resources.

Mermentau River Basin

Plan 24 involves raising the water level of Grand and White Lakes by one foot via the use of levees and control structures. This plan would have significant adverse impacts on fish and wildlife resources. Major areas of deep fresh marsh would be converted to open water, and existing aquatic beds may not be able to sustain themselves. Also, the production of annual grasses and sedges valuable as waterfowl food would be virtually eliminated due to inability to achieve summer drawdowns of the adjacent marshes. Such action would also negate ongoing efforts to permit estuarine organisms (e.g., shrimp, crabs, etc.) use of Grand and White Lakes, as ingress would be largely eliminated. Since the proposed plans will impact Lacassine NWR, which is located adjacent to the northwest shore of Grand Lake, coordination with the Refuge Manager there would be necessary.

Plan 25 consists of the raising of the water level of White Lake by two feet via construction of a levee around the lake. Significant impacts to fish and wildlife resources are associated with this plan. Borrow areas around the perimeter of the lake would increase bottom depths by nine feet; this deep area may serve as an anoxic nutrient and contaminant sump due to lack of adequate water circulation. The levee would effectively cut off detrital flow between the lake and the adjacent marshes; in addition, ingress and egress of aquatic and estuarine organisms would be prevented. The shallow nearshore zone would also be severely degraded by excavation of levee borrow. Levee construction would impact 273 acres of productive fresh marsh.

Plan 26 would impound a 12,500-acre area in the vicinity of Maple Marsh, located north of Grand Lake. The water depth in the impoundment would be increased by eight feet via construction of 20 miles of levee. This project would result in the destruction of 8,500 acres of fresh marsh via impoundment. The Maple Marsh area is ranked sixth out of the 14 key waterfowl wintering areas in the Central Gulf Coast Region (USFWS 1982; see Figure 2). The impoundment of this area, and the resulting loss of vegetation, would virtually eliminate it's value to furbearers and greatly reduce its value to wintering waterfowl, particularly puddle ducks. Losses to wildlife and fishery resources would be lessened if the reservoir were confined to nonwetland areas.

Plan 27 consists of the diversion of water from the Atchafalaya River into the Mermentau River via Bayou Plaquemines Brule; the resulting increased flow would make more water available for irrigation. The plan calls for excavation of 17 miles of new channel between Krotz Springs and Opelousas; approximately 5 miles of new channel would be

excavated in forested wetlands of the West Atchafalaya Floodway. Such excavation would result in the permanent destruction of more than 100 acres of productive bottomland hardwood habitat from the 180-foot-wide channel right-of-way. However, the impacts associated with the new channel could be lessened if existing Teche-Vermilion Freshwater Diversion Project facilities were utilized. Clearing and snagging on the upper 45 miles of Bayou Plaquemine Brule, if limited to instream obstructions, would have minimal impact because the stream has been previously channelized. However, fish and wildlife resources would suffer serious adverse impacts if clearing and snagging included extensive removal of streamside and bank vegetation. It is likely that the increased flows in Bayou Plaquemine Brule and the Mermentau River would be beneficial to fisheries by increasing dissolved oxygen levels during historical low-flow conditions.

The water supply in the Mermentau Basin needs further study to ensure that previous demand projections are accurate and based on current cropping patterns and irrigation water sources.

FUNDING NEEDS FOR FISH AND WILDLIFE STUDIES

Additional fish and wildlife studies will be necessary as this study proceeds into later stages of planning. These include an additional Planning Aid Report for the evaluation and selection of alternatives, a draft Fish and Wildlife Coordination Act (FWCA) Report, and a final FWCA Report. Our preliminary estimate of the funding requirements for the above three items are $32,000, $32,000, and $10,000 respectively, or a total of $74,000.

PLANNING OBJECTIVES AND CONSTRAINTS

Any work performed on or affecting National Wildlife Refuges will require prior FWS approval. This is to insure that the work is consistent with the purposes for which the land was acquired. In addition, any actions having potential impacts on endangered species or their habitat may require consultation with this agency under Section 7 of the Endangered Species Act. Construction activities at a distance of less than 1500 feet from an existing bird colony or less than 1 mile from an eagle nest would be restricted to the non-nesting season; such activities should be further coordinated with this office.

PROJECTED FUTURE WITHOUT-PROJECT CONDITIONS

Acreage projections (developed by NODCE) for the study area under future without-project (FWOP) conditions are presented in Table 4. These projections are based on the continuation of existing wetland-loss trends for the various habitat types, and the assumption

Table 4. Acreage projections by habitat type for future without-project conditions for the Louisiana Coastal Area.

Habitat Type	Target Year (acres X 1000)				
	1978	1990	2000	2020	2040
Forested wetlands	637.4	602.3	569.3	512.5	454.2
Emergent marsh					
Fresh/intermediate	1183.3	1098.1	1056.7	949.0	863.4
Brackish	911.5	865.9	801.8	671.8	579.2
Saline	434.3	375.6	331.9	292.0	258.9
Total marsh	2529.1	2339.6	2190.4	1912.8	1701.5
Open water	5542.4	5767.0	5949.2	6285.6	6553.2
Total	8708.9	8708.9	8708.9	8708.9	8708.9

that various authorized Corps of Engineers projects (e.g., Mississippi Delta Region Project, New Orleans to Venice, Louisiana, Hurricane Protection Project) are in place. Some of those projects include marsh creation features. All wetland habitat types are expected to suffer acreage losses; open water habitats will experience a corresponding gain.

Resource use and harvest estimates for selected commercial and recreational activities under FWOP conditions are presented in Table 5. The methodology for this type of analysis has been discussed in detail by USFWS (1983) and USFWS (1980). Predictions for the year 2040 assume a direct relationship between wetland acreage and resource use or harvest. The figures presented herein are rough estimates based on existing available data; a more detailed analysis of resource use can be conducted during later planning stages.

The major activities that take place in the study area (i.e., commercial and recreational fishing, waterfowl hunting, and trapping) are all predicted to show substantial losses over the project life (Table 5). Commercial fishery landings are expected to decrease from 1.6 billion pounds to 1.0 billion pounds, a $67 million loss in value, by the year 2040. The number of recreational fishing trips is expected to show a 33 percent decrease, from 3 million to 2 million trips, for a $4 million decrease in value. Waterfowl hunting is expected to decrease by about 300,000 man-days ($12 million dollar loss), and fur and alligator combined harvest would decrease by 289,000 skins (worth $2.7 million). The total value for all activities is expected to decrease from $240 million to $162 million, or a loss of $78 million (32 percent).

DISCUSSION

Some of the alternatives proposed by NODCE have only minimal impacts to fish and wildlife resources, while others have substantial impacts. We strongly recommend that the degree of impact be considered in the process of selection of alternatives for further study; such selection should not be based solely on economic benefits. Only a few alternatives considered would have significant long term adverse impacts; we recommend that those alternatives (i.e., Plans 12, 13, 14, 24, 25, 26) be deleted from further consideration. Alternatives that have potential beneficial impacts to fish and wildlife resources, such as saltwater barriers or freshwater diversion (i.e., Plans 6 and 27), should be studied further. Adverse impacts to fish and wildlife resources resulting from any alternative should be minimized through proper planning and design, and a mitigation plan to compensate for unavoidable losses should be developed. Mitigation costs should be included in the benefit-cost analysis of any alternative, and mitigation features should be implemented concurrently with any other project features.

Table 5. Resource use and harvest projections for selected activities in the Louisiana Coastal Area underfuture without-project conditions.

Activity	Baseline[a]		2040[a]	
	Quantity ($\times 10^6$)	Value ($\times 10^6$)	Quantity ($\times 10^6$)	Value ($\times 10^6$)
Commercial fishing[b]	1,550 lbs.	\$205.0	1,040 lbs.	\$138.0
Recreational fishing[c]	3.0 trips	12.5	2.0 trips	8.4
Waterfowl hunting[d,e]	0.956 man-days	13.2	0.663 man-days	9.1
Fur trapping[d]	0.982 pelts	7.3	0.696 pelts	5.2
Alligator harvest[d]	0.010 skins	2.1	0.007 skins	1.5
Total value		240.1		162.2

a. Baseline quantity values, obtained from various sources (cited below), were divided by 1978 acreages to obtain quantity/acre; this figure was then applied to the 2040 acreage values to obtain an estimate for that year.

b. Based on 1978 to 1983 mean of commercial landings and dockside values, from NMFS 1980b, 1982, and 1984.

c. Quantity of trips from NMFS 1980a; value per trip from U.S. Army Corps of Engineers 1983b.

d. From USFWS 1983.

e. Value per man-day for waterfowl hunting from U.S. Army Corps of Engineers 1982.

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LOUISIANA COASTAL AREA, LOUISIANA

INITIAL EVALUATION REPORT

ON

WATER SUPPLY

APPENDIX B

LETTERS AND COMMENTS RECEIVED AT PUBLIC MEETINGS
ON AUGUST 27 IN BELLE CHASSE, AUGUST 28 IN HOUMA, AND
AUGUST 30, 1984, IN CAMERON, LOUISIANA

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APPENDIX B

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APPENDIX B

Summary of Oral Comments on
Water Supply
Presented At Public Meetings

(The summary of oral comments voiced at the three meetings are presented below by problem area.)

Grand Isle. Most of the comments on the Grand Isle findings were favorable. One suggestion was to investigate, in more detailed studies, a pipeline to import water from LaFitte to Grand Isles.

Houma Area. While some agreed with the study finding, a large number did not. The consensus was that a saltwater barrier in the Houma Navigation Channel would offer the best solution to the area's problem if the saltwater effect on the marsh and land loss were considered in the benefits analysis.

Plaquemines Parish. Generally, no adverse comments were voiced.

River Parishes. The plans formulated for the River Parishes generated a great deal of controversy. The U.S. Fish and Wildlife Service, the Louisiana Wildlife and Fisheries Commission, the Louisiana Department of Natural Resources, the Louisiana Department of Transportation and Development and others were all opposed to Plans 13 and 14, storage at Davis Pond and Big Mar. The plans were considered adverse to the environment and had the potential to delay the freshwater diversion project.

Cameron-Holly Beach. Comments of Corps findings were favorable. One source stated that a new well, much closer than Hackberry, has supplied fresh water.

Mermentau River Basin. Opposition was stated for all three plans investigated for this area. The consensus was that the recent change in agricultureal pursuits from rice to soybeans has probably diminished the need for a project.

STATEMENT
PRESENTED TO
NEW ORLEANS DISTRICT
U.S. ARMY, CORPS OF ENGINEERS

ON

LOUISIANA COASTAL AREA, LOUISIANA

SHORE AND BARRIER ISLAND EROSION
LAND LOSS AND MARSH CREATION
AND
WATER SUPPLY

INITIAL EVALUATION STUDIES

AUGUST 28, 1984
HOUMA, LOUISIANA

IN BEHALF OF
THE STATE OF LOUISIANA

BY
MARTY J. CHABERT
ASSISTANT SECRETARY
OFFICE OF PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

ARTHUR R. THEIS
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PUBLIC MEETING CONCERNING:

Louisiana Coastal Area, Louisiana Land Loss and Marsh Creation Initial Evaluation Study

Louisiana Coastal Area, Louisiana Shore and Barrier Island Erosion Initial Evaluation Study

Louisiana Coastal Area, Louisiana Water Supply Initial Evaluation Study

INTRODUCTION

This statement has been prepared by the State of Louisiana, Department of Transportation and Development, Office of Public Works. We are pleased to have the opportunity to present this statement to the New Orleans District, Corps of Engineers, in response to the notice of public meetings which invited comments on the initial evaluation of the three (3) studies.

The Department of Transportation and Development, Office of Public Works, is the engineering and planning agency for the State of Louisiana which has the responsibility of formulating plans and promoting and constructing projects for the timely and orderly development of the vast water resources of the State of Louisiana. In carrying out these broad responsibilities, the Office of Public Works maintains a close liaison with the U.S. Army, Corps of Engineers. We are gratified with the long cordial relationship which has been achieved and we are looking forward to a continuation of this joint effort which is mutually beneficial to the nation and the State of Louisiana. I would first like to address the Land Loss and Marsh Creation and Shore and Barrier Island

Erosion Initial Evaluation Studies since these studies are so inter-related and then separately discuss the Coastal Water Supply Initial Evaluation Study.

I would like to start by congratulating the Corps on these studies. I think the two studies in question show a good understanding of the natural and man made problems of land loss and erosion of our coastal areas. Our office has long thought that some structural measures were necessary to retard the erosion of Louisiana's coastal areas. A structural solution that we think deserves further looking into is the development of closures in the barrier island chains to reduce salt water intrusion in Terrebonne Bay, Timbalier Bay, and Barataria Bay. These closures could reduce the salt water intrusion into these areas to allow for re-vegetation and re-establishment of these marsh areas that are being lost at a faster rate than anywhere else along the coast. We are pleased, however, to see both structural and non-structural solutions to erosion and marsh creation offered in these studies.

The problem we have is that all the good work done in the studies is offset by an inappropriate method for determining benefit/cost ratios which does not adequately address the coastal realities of our state. The method does not accurately estimate the value of our marshes and barrier islands and leads to low benefit/cost ratios which severely underestimate the value of the projects in question.

A new method for determining the benefits of our wetlands must be developed that will take into account their value as storm buffers to human settlements along the coast and their esthetic, ecological, and social values to Louisiana. Furthermore, the

present method does not seem to take into account the value of the infrastructure that will be lost if the coastal erosion problem is not solved.

I believe that the New Orleans District, Corps of Engineers, is aware that the present method of determining the beneficial aspects of marsh and barrier island protection does not adequately address the situation that exists in Louisiana. The current system of determining the value of our marshes is very narrow, giving dollar values for our marsh as real estate, and as a producer of commercial and recreational fish and wildlife but very little more. It does not take into account what you in your Land Loss and Marsh Creation study call "intangibles". The "intangibles" in this case may turn out to be life as we know it in south Louisiana.

Unlike most other states which have only small amounts of uninhabitable wetlands, Louisiana has millions of acres of wetlands, 41 percent of all the wetlands in the lower 48 states, and our coastal zone is inhabited by over 2 million people. The Land Loss and marsh Creation study states, and I quote:

> "Land loss seriously threatens the very vitality of the coastal area and its capacity to support the multi-use functions important to the state and the nation."

It further states that if nothing is done to stop erosion, not only will the state and the nation suffer a tremendous loss of commercial and recreational fisheries, but by the year 2040, 155 miles of waterways will be lost to open water and will require increased maintenance dredging; 55 miles of federal hurricane protection projects that protect New Orleans and other coastal communities will have to be shielded from erosion and enlarged to

maintain their current level of protection; 94 miles of federal and state highways, 27 miles of railroad track, 1,570 miles of oil and gas pipeline and 333 miles of gas, water, electric power and telephone lines will have to be relocated.

It goes on to state that in addition to this:

> "About 1,800 businesses, residences, camps, schools, storage tanks, electric power substations, water control structures, and pumping stations for gas, oil, and water will have to be protected or relocated."

These are just some of the "intangibles" which were not considered in the evaluations of the proposed projects in the Land Loss and Marsh Creation and the Shore and Barrier Island Erosion Studies. These factors must be considered in any system that places a value on our wetlands in order to determine the real benefits of these projects. Why can't protection of these things be included on the benefit side of the benefit/cost ratio? Let's look at Project on Page 7 of the Shore and Barrier Island Erosion study. The study estimated that between 1979 and 1981 that 170,000 people visited the Fort annually. It goes on to say that "the Fort will soon be undermined if erosion is not checked." Yet, the benefit value for creating a breakwater to save the fort is placed at $400 a year. The Corps' reasoning for this is that less than an acre of marsh will be saved by this breakwater project per year. The average value of Louisiana marsh is $1,500 per acre. Therefore, the value of building the breakwater is only about $400 a year. In other words, the value given to this project does not take into account the possible loss of Fort Pike or the social and monetary value of the 170,000 annual visitors to the historic fort. It merely estimates the value of the amount of marsh lost per year.

The Terrebonne Parish Barrier Islands project on Page 9 is another good example where the present benefit accounting system does not fully assess the benefits of the project. The study discussing the Timbalier and Isles Dernieres Island chain, states:

> "If the present situation continues, most of the Terrebonne islands will be gone by 2040. Once they are lost, Terrebonne Parish will become completely vulnerable to storm attacks and the nation will lose the important resources of the islands."

But, again the benefit accounting system only accounts for the value of the marsh loss showing an annual average benefit of $1,108,500 and a benefit/cost ratio of 0.9 to 1. The benefit accounting system does not seem to account for the hundreds of homes and camps and the infrastructure for them that will become vulnerable to storms if these barrier islands are lost. This project would certainly have a favorable benefit/cost ratio if all the real benefits of the project were included.

The present system of analyzing marsh benefits may be fine for other areas of our country with small amounts of uninhabited wetlands, but it does not give a realistic value to marsh building or erosion prevention projects in Louisiana. Furthermore, all the benefit/cost ratios of the Land Loss and Marsh Creation and the Shore and Barrier Island Erosion projects are grossly underestimated. A new system for evaluating the value of wetland erosion prevention and marsh creation projects needs to be developed which takes into account the coastal conditions of Louisiana.

The two studies, Louisiana Land Loss and Marsh Creation and Louisiana Shore and Barrier Island Erosion, seem to be so inter-

related that they should be considered as one. Why not combine these two into one study, devise a conglomerate solution, and determine one benefit/cost ratio for the entire conglomerate?

I would now like to comment of the Coastal Water Supply Initial Evaluation Study.

The State of Louisiana through the Water Resources Study Commission staffed by the Department of Transportation and Development, Office of Public Works, has just completed a comprehensive review of the water situation in the State. In addition to the Water Resources Study Commission's report, the Office of Public Works has prepared an in-house document on alternative solutions to water supply problems. In that report, we have looked at the same problem areas in coastal Louisiana as did the Corps.

I will discuss each one comparing the results.

Grand Isle

We both agree on the amount of additional water required by Grand Isle and that a desalination plant for treating brackish groundwater is the best alternative (Your Plan 3). The desalination plan is good because it provides a reliable year round source of water for Grand Isle on Grand Isle. It does not rely upon a water treatment system in a neighboring parish with its accompanying long pipe lines to Grand Isle. It also does not rely upon barges to ship freshwater in which could create a logistics headache for scheduling, not to mention sanitation problems. We feel, therefore, that the other plans do not compare favorably with the desalination of brackish groundwater.

A lot of ground work has already been done on a possible desalination plant for Grand isle which was prepared for the U.S. Department of Interior, Office of Water Research and Technology. From this information, the Office of Water Research and Technology chose Grand Isle for a desalination demonstration project. Unfortunately, this project was cancelled before construction. Possibly this information would be beneficial to the you in your further study.

Houma

The Office of Public Works' projections for public supply water requirements in Terrebonne Parish for the year 2020 indicate a need for 22 million gallons per day. Since Houma's public supply system provides water not only to the City of Houma but also provides all the water to Terrebonne Parish Water Districts 2 and 3 and some water to Water District No. 1 we, therefore, believe that Houma's needs listed by the Corps for the year 2020 of 12 million gallons a day may be low.

We are in agreement with the alternative of using Bayou Lafourche as a source of freshwater (Plan 7). Even though Bayou Lafourche is in another parish, Houma would only be relying on it for a source of raw water continuing to use their existing treatment plant. This alternative is presented as an emergency 50 day supply during periods of saltwater intrusion into the Gulf Intracoastal Water Way; but there really is no reason why this could not become Houma's permanent source of supply, if that becomes necessary or desirable.

The reservoir storage plan (Plan 9) we suspect would not be adequate if, in fact, 22 million gallons a day were needed by the year 2020, because the dependable yield of the reservoir could not meet the demand.

Plaquemines Parish

Open reservoirs appear to be the best alternative using the benefit/cost ratio. You state that "some marsh may be lost in construction of the reservoir," but that "the environmental impacts are not severe." Our concern is the benefit/cost ratio may not be adequate for the determination of the benefits of marsh land as we have mentioned earlier. Therefore, we feel that the 3.3 benefit/cost ratio may be artificially high and misleading. A new system for determining the value of marsh land is needed. However, we do agree that this plan looks promising and merits further study.

The River Parishes

You are recommending reservoirs which may have associated environmental problems. Even so, we believe the alternative should be studied further.

An additional alternative merits investigation, that is, groundwater below Lake Pontchartrain. The color of the groundwater is not ideal, but the quality meets the standards.

Cameron-Holly Beach

The community of Holly Beach through the creation of Cameron Water Works District No. 10 has recently started purchasing groundwater from Cameron Water Works District No. 2 in Hackberry which is what you recommended in Plan 22.

We are in agreement that Cameron has a problem with high chlorides in their water supply and with your alternative Plan 22, "Import groundwater from a more northerly site." We, however, would recommend a well field site east of Calcasieu Lake and north of Creole rather than at Hackberry.

Importing water from the Intracoastal Waterway, Plan 20, shows promise but would require treatment. Desalination of brackish groundwater, Plan 21, we believe would also merit additional study. The benefit/cost ratio should improve with a smaller desalination plant now that Holly Beach has solved its problem.

Mermentau River Basin

A feasibility study on the management of the Grand and White Lakes Complex is being done by the U.S. Army, Corps of Engineers. Since the Mermentau River is supplemented by water from the Grand and White Lake Complex, the two studies should be integrated no mater which alternatives are chosen.

Plan 26, storage north of GIWW indicates the highest benefit/ cost ratio. However, again let me point out that the B/C ratio may be misleading and should be reevaluated when a new system for adequately determining the benefits of marsh land is established.

I would like to thank the U.S. Army, Corps of Engineers, for giving us this opportunity to comment on these three studies tonight. I hope that our comments will be of some help to you. You are welcome to any information we may have that will assist you in your further studies. We do wish to be kept apprised of your findings and wish to be part of the planning process as we think it is our assigned responsibility to do so.

Good evening, ladies and gentlemen, I am David Chambers with the Louisiana Department of Natural Resources. Our agency has been designated by Governor Edwards to represent Louisiana in coastal matters affecting our state.

At the state level we are very concerned with the preservation and management of our remaining coastal wetlands and the wide array of valuable resources associated with them. As most of us here tonight are aware, we are losing our coastal barrier islands and marshes at an alarming rate. We must take steps to stop the loss of these coastal lands and to preserve their beauty and productivity for future generations to come.

The state has been actively pursuing and developing a coastal protection program to address these concerns. We are presently in the process of designing and implementing projects to help offset the impacts of coastal land loss. Examples of such projects include barrier island and beach restoration, freshwater diversion, marsh creation, and wetland management programs.

These projects are designed to complement the efforts of federal government agencies as well as those of parish or local governments. We would like to commend the Corps of Engineers for recognizing the severity of our coastal land loss problems and for undertaking these studies aimed at identifying potential solutions to these serious problems facing our coastal parishes.

The three studies being discussed tonight have the potential to reduce erosion, saltwater intrusion, and land loss, to improve fish and wildlife productivity, and to enhance our available freshwater supplies. We support the proposed recommendations for futher study with the exception of Plans 13 and 14 which propose the use of the freshwater diversion sites at Davis Pond and at Big Mar as freshwater storage locations. We believe that any proposal to consider freshwater storage at these locations will result in further delays in implementing the freshwater diversion project in these basins where freshwater inputs are desperately needed. Therefore we request that the Corps of Engineers delete Plans 13 and 14 from further consideration.

It is appropriate at this time to recognize and applaud the coastal protection efforts of the Terrebonne Parish government and the elected state and federal officials representing this area. The Department of Natural Resources through its Coastal Protection Program, will work closely with Terrebonne Parish and other coastal parishes in implementing a coastwide plan to preserve and maintian our disappearing wetlands, beaches, and barrier islands. Thank you. Colonel Willis.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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LAFAYETTE, LOUISIANA 70502

STATEMENT OF U.S. FISH AND WILDLIFE SERVICE PRESENTED AT PUBLIC MEETINGS TO DISCUSS STUDY FINDINGS REGARDING WATER SUPPLY, LAND LOSS AND MARSH CREATION, AND SHORE AND BARRIER ISLAND EROSION IN THE LOUISIANA COASTAL AREA - AUGUST 27, 28, AND 30, 1984

Colonel Witherspoon, distinguished guests, ladies and gentlemen, my name is David Fruge, Field Supervisor of the Lafayette, Louisiana, Field Office of the U.S. Fish and Wildlife Service. I am presenting this statement on behalf of Mr. James W. Pulliam, Jr., Regional Director of the Fish and Wildlife Service in Atlanta, Georgia. My statement represents the views of the Service on the alternatives being considered for water supply, land loss, and shore and barrier island erosion in the Louisiana Coastal Area.

Coastal Louisiana is experiencing dramatic habitat changes. Louisiana's coastal marshes are being lost at a rate exceeding 25,000 acres per year, Louisiana's shoreline and barrier islands are breaking up and retreating at an alarming rate, and much of the fresh water and sediments which built and nourished its coastal wetlands are now funneled into the Gulf of Mexico. This deterioration is of great concern to the Service because of the national importance of Louisiana's coastal wetlands to migratory waterfowl and other migratory birds, fur animal and alligator harvest, and sport and commercial fisheries.

We concur with the Corps' identification of the nature and severity of the land loss problems in coastal Louisiana. We also agree that the alternatives presented in the Notice of Study Findings for the Land Loss and Marsh Creation Study would serve to create marsh and, as such, would greatly benefit fish and wildlife resources. Therefore, we concur that investigation of marsh-creation alternatives such as placement of dredged material, diversion of sediment-laden Mississippi River water, and transport of bottom sediments from Chandeleur Sound and from the Mississippi River to nearby subsiding areas should continue. However, alternatives other than marsh-creation should be considered. Measures which would slow the rate of marsh loss and thereby preserve existing marsh were recommended in our June 18, 1984, Planning Aid Report, and include construction of saltwater barriers on the Mississippi River - Gulf Outlet, the Houma Navigation Canal and other major navigation channels, installation of a plug or sediment barrier at the mouth of Pass-a-Loutre, and increasing freshwater flows into Bayou Lafourche.

Regarding the Water Supply Study, the Fish and Wildlife Service believes that lack of adequate freshwater inflow into coastal marshes may be the most serious water supply problem in the study area. Corps of Engineers navigation and flood control projects have contributed greatly to this problem. We believe that the present study should address this problem and not be limited to municipal/industrial water supply problems.

In the Houma area, construction of a saltwater barrier across the Houma Navigation Canal (Plan 6), was eliminated from further study because of alleged environmental problems. However, the Service believes that this plan would have extensive positive impacts to fish and wildlife resources; these benefits would be based on a reduction in marsh loss and a decrease in the conversion of fresher marshes to more saline marsh types. The barrier could be designed to allow ingress and egress of estuarine organisms. Any negative construction-related impacts would be small in relation to the positive impacts associated with such a structure. In addition, the economic benefits and costs of this plan are in line with Plan 9, which was recommended for further study. Therefore, the Service recommends that Plan 6 be retained for more detailed study.

We agree with the Corps' assessment that water supply Plans 13 and 14 would have significant environmental impacts. According to members of your staff, the proposed reservoirs would impact approximately 7,425 acres of fresh marsh at Davis Pond and 7,000 acres of intermediate marsh at Big Mar, both sites for future freshwater diversion projects. These areas serve as valuable habitat to many species of fish and wildlife. Depending on the depth and duration of flooding, use of those areas for water supply purposes could have extreme adverse effects on wetland-associated wildlife. The wetlands to be affected at the Davis Pond site include marshes located on the Salvador Wildlife Management Area, operated by the Louisiana Department of Wildlife and Fisheries. In addition, such dual use of the freshwater diversion sites may lead to conflicts between uses at certain times. For example, communities desiring to use these sites for water supply may apply pressures to the operating agency to cause a delay or postponement of freshwater releases into the marshes. Further, we are seriously concerned that detailed studies of the Davis Pond and Big Mar sites for use as water supply reservoirs may delay the critically needed freshwater diversion projects now being planned for these two sites. Therefore, we recommend that Plans 13 and 14 be eliminated from further study.

Based on recent changes in irrigation and cropping patterns in the Mermentau Basin, we question whether existing freshwater supplies will be inadequate to meet future demands. Therefore, we request that further studies be carefully designed to accurately assess water supply needs in that basin.

With regard to the Shore and Barrier Island Erosion study, the Corps of Engineers has recommended further study of erosion control plans for the Terrebonne Parish Barrier Islands (comprised of the Timbalier Island/ Isles Derniers complex) and for Holly Beach and adjacent beaches.

The Service supports plans to prolong the life of the Terrebonne Parish Barrier Islands which provide for:

- o filling to increase the width of the islands;
- o planting of natural vegetation and erecting sand fencing to stabilize dunes; and
- o implementing a beach nourishment program that avoids near-shore borrow areas.

The Fish and Wildlife Service also supports plans at Holly Beach and vicinity which include:

- o building dunes;
- o planting native vegetation and erecting sand fences;
- o constructing elevated walkways over dunes; and
- o initiating a beach nourishment program.

In a letter to the Corps, dated April 30, 1984, the Fish and Wildlife Service identified several data gaps including:

- o an evaluation of measures designed to reestablish longshore sediment transport at the mouths of major navigation channels; and
- o an evaluation of measures to preserve the remaining natural shell reefs in Atchafalaya Bay and in the Gulf of Mexico near Marsh Island and Point an Fer Island.

The Service reiterates its recommendation that the Corps address these and other information needs identified in the Service's April 30 letter.

Portions of the barrier island and shoreline areas recommended for further study are units of the Coastal Barrier Resources System, which was established under the Coastal Barrier Resources Act of 1982. If the Corps of Engineers intends to expend Federal funds within a unit of the Coastal Barrier Resources System, a letter requesting consultation under provisions of the Coastal Barrier Resources Act should be sent to the Service's Regional Director in Atlanta, Georgia.

In conclusion, the Fish and Wildlife Service believes that the alternatives considered in the Land Loss and Marsh Creation and the Shore and Barrier Island Erosion studies would substantially benefit fish and wildlife resources in coastal Louisiana, and recommends that the scope of alternatives for these studies be broadened. The Service also recommends that those Water Supply alternatives with severe adverse environmental impacts be eliminated from further study; these include Plans 12, 13, 14, 24, 25, and 26.

We sincerely hope that many of the habitat enhancement measures being considered will eventually be implemented so that the rich renewable resources of the Louisiana coastal region can be maintained for future generations.

Thank you.

ERNEST N. MORIAL, President
ANNE M. MILLING, President Pro-Tem.

Sewerage & Water Board OF NEW ORLEANS

HAROLD R. KATNER
Executive Director

CITY HALL · CIVIC CENTER
NEW ORLEANS, LA., 70165 · 586-4588

September 11, 1984

Mr. Norman Haydel
Army Corps of Engineers
Regional Planning Branch
P.O. Box 60267
New Orleans, LA 70160

Dear Mr. Haydel:

We appreciate your sendi[illegible] us a copy of your Louisiana Coastal Water Supply Study. After reviewing it, we wish to offer our comments.

We feel your estimate of the amount of water needed (214 million gallons per day) appears reasonable. The New Orleans systems average 140 million gallons per day. If the alternative storage would only be used in emergencies, and curtailed water usage could be mandated, than this amount would probably be sufficient.

Plan 13 covering Davis Pond appears to be a major drawback for us due to the river crossing with a large diameter pipeline to service the major water users which are on the Eastbank. Plan 14 covering Big Mar also appears to have some problems due to salt water intrusion, even if infrequently. The water stored should be expected to be turned over at some frequency leading to the possibility of having saline waters. In reality, this could be a small continuous diversion. Therefore, it may be more feasible to use a combination of both plans on a smaller scale to satisfy the systems on either bank of the river.

From your study we noted there may be negative environmental effects. However, we are unable to determine the full extent. While a certain amount of disruption may be inevitable, we hope you will give environmental concerns a high priority.

We are very interested in this study and would appreciate being notified of your proceedings as they develop. Thank you for your consideration.

Sincerely,

Harold R. Kather
Executive Director

HRK/MON/md
3152d

JEFFERSON PARISH
LOUISIANA
OFFICE OF PARISH PRESIDENT

JOSEPH S. YENNI
PARISH PRESIDENT

September 14, 1984

Lt. Col. Edward J. Willis
U.S. Army
Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160

Re: B&A Job No. 8427-99

Dear Lt. Col. Willis:

Let us first congratulate the Corps for taking the initiative to hold public hearings regarding such serious issues as land loss, erosion and water supply problems in the state of Louisiana.

As you are aware, in Jefferson Parish, the sole source of drinking water supply is the Mississippi River. It's an open and navigable water body prone to toxic spills and thus, there is the possibility of contaminating the drinking water supply. The other problem with the present system is the lack of storage capacity for emergency purposes. These two problems underscore the need to evaluate alternate sources of drinking water supply and the storage facility for emergency purposes.

Based on the literature search done by the Parish's consultants, Burk and Associates, Inc., it is clear that there are three main fresh water aquifers in the region, namely 200-foot, 400-foot and 700-foot sand.. Most of the ground water supply of current users, largely private, comes out of these aquifers and so they are limited in their potential for emergency supply requirements of the Parish. On the other hand, ground water is one of the main alternates to consider because it does not have the instant contamination potential like the river water does. Therefore, it is relatively safe.

There is freshwater aquifer in the northern as well as the western parts of Lake Pontchartrain. An exploratory study, done by the USGS in Orleans Parish's part of the Lake, showed the existence of freshwater aquifers. However, nothing along these lines has ever been done in Jefferson Parish's part of the Lake.

Until some time ago, it was not known to us what might be the extent of aquifers in the southern parts of Lake Pontchartrain. In the absence of any exploratory borings, the information on the availability of water was arrived at by evaluating the existing electrical logs for oil and gas wells. The logs were provided by the Department of Conservation and Resources, Baton Rouge.

SUITE 402, 3330 N. CAUSEWAY BOULEVARD, P. O. BOX 8550, METAIRIE, LOUISIANA 70011, 504-834-7700

At the Coprs of Engineers' Public Hearing in Belle Chasse, three topics were considered to be the theme of the Hearing: (1) water supply, (2) land loss and (3) erosion. Not much was said about drinking water problems. The present water supply is dependent upon the characteristic fluctuations of the Mississippi River water. A phenol spill in early 1981 made the tap water undesirable for drinking for several days and there was no alternate supply or adequate storage reservoir to switch over to. If anything massive ever occurs, there will not be an alternate source of water supply to rely on. This makes it more urgent and important to look for a pragmatic solution to this problem.

Looking towards the ground water as the ptential source seems to be the way to solve this problem.

Existing ground water aquifers in Jefferson Parish could be evaluated in terms of storing treated Mississippi River water to be pumped out in case of an emergency, or exploration could be done to evaluate the existing aquifers in the southern part of Lake Pontchartrain in Jefferson Parish.

Existing aquifers in the Lake may very well have the potential for solving our problems along with a fresh water reservoir of capacity to provide for no less than a 15 day emergency. Therefore, it is our request that the Corps consider these as viable alternatives in solving the drinking water problem and include these two options to be a part of Phase II of the study, which is the "Feasibility Study" of the alternatives.

For your information, we are attaching a copy of Resolution No. 50994 of the Jefferson Parish Council meeting of June 6, 1984, which indicates the serious concern of the Council in this water supply problem and calls upon the congressional delegation for their help.

Very truly yours,

JOSEPH S. YENNI
PRESIDENT

On motion of Mr. Ward, seconded by Mr. Hof, the following resolution was offered as amended:

RESOLUTION NO. 50994

A resolution requesting Senators J. Bennett Johnston and Russell Long and Congresspersons Lindy Boggs, Billy Tauzin, and Bob Livingston to give assistance to Jefferson Parish to locate and obtain federal funding assistance for planning and improvements to its overburdened water system, and authorizing the Council Chairman, or in his absence, the Vice-Chairman to execute a contract with Burk and Associates, Inc., for professional engineering services and assistance in obtaining said federal funding assistance and to further execute a contract with Burk and Associates, Inc., for professional engineering services in connection with those projects, particularly, needed water plant expansions, that are funded in whole or in part by the efforts of Burk and Associates, inc., and our congressional delegation in obtaining federal funding assistance for said projects.

WHEREAS, the Parish of Jefferson has experienced tremendous residential, commercial, and industrial growth since the capacity of the existing water plants were last increased; and,

WHEREAS, at this time the ability of the Parish of Jefferson to make and supply water to its customers is rapidly becoming inadequate to meet demands; and,

WHEREAS, it is necessary that the parish request funding assistance from its congressional delegation to address the needs of its overburdened water system; and,

WHEREAS, the engineering firm of Burk and Associates, Inc., in conjunction with the Parish of Jefferson Federal Liaison Department, has successfully assisted the parish in the past in the area of securing funds, as well as in design of facilities.

NOW, THEREFORE, BE IT RESOLVED by the Jefferson Parish Council, acting as the governing authority of said parish:

SECTION 1. That Senators J. Bennett Johnston and Russell Long and Congresspersons Lindy Boggs, Billy Tauzin, and Bob Livingston are hereby requested to give assistance to the Parish of Jefferson to locate and obtain federal funding assistance for planning and improvements to its overburdened water system.

SECTION 2. That the Council Chairman, or in his absence, the Vice-Chairman, be and is hereby authorized and empowered to execute a contract with Burk and Associates, Inc., for professional engineering services in assisting the Jefferson Parish Congressional Delegation and the Parish of Jefferson Federal Liaison Deparment in locating and obtaining federal funding assistance for planning and improvements to Jefferson Parish's overburdened water system for a period not to exceed two (2) years.

SECTION 3. That the Council Chairman, or in his absence the Vice-Chairman, be and is hereby authorized and empowered to execute a contract with Burk and Associates, Inc., for professional engineering services in the planning, design, and construction of those projects, including east and west bank water plant expansions, that are funded in whole or in part with the federal funds obtained through the efforts of Burk and Associates, Inc., and the Jefferson Parish Congressional Delegation for a period not to exceed two (2) years.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: 7 NAYS: None ABSENT: None

The resolution was declared to be adopted on this the 6th day of June, 1984.

THE FOREGOING IS CERTIFIED TO BE A TRUE AND CORRECT COPY

Dolores H. Gonzales

DOLORES H. GONZALES
PARISH CLERK
JEFFERSON PARISH COUNCIL

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September 07, 1984

Colonel Eugene S. Witherspoon, District Engineer
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P.O. Box 60267
New Orleans, Louisiana 70160

RE: Public Hearing Comments
Louisiana Area Studies
Initial Evaluation

Dear Colonel Witherspoon:

The Terrebonne Parish Council would like to take this opportunity to welcome you to South Louisiana and the nation's largest wetland consisting of 6.5 million acres. As you may already know however, these wetlands are out of balance.

Terrebonne Parish, which comprises over 10% of these wetlands, is washing away into the waters of the Gulf of Mexico. This land has always been battered, broken up and swept away by the gulf, but in ages past it was balanced by the build-up of land created by the flow of seasonal flooding of the Mississippi River and its associated bayous. Today, artifical levees and flood control projects have stopped Mississippi River flooding and the associated build-up of new land. Other man-made activities such as canalization and oil and gas exploration, have contributed to the problem. Compounding these problems are the natural processes of land subsidence and sea level rise. All of these problems have contributed to land loss figures which exceed 17 acres a day within the boundaries of Terrebonne Parish.

The man-made elements that have altered flow regime sediment patterns and vegetative assemblages have created a problem. Land loss forces now supersede constructive forces, thus threatening the jobs, industries, and life-styles of the people whose lives are tied directly or indirectly to the coast. The final question is, "Can we afford the loss?". We, of Terrebonne Parish feel the only answer to this question can be NO! We hope that the federal government, and particularly the Corps of Engineers, feel the same and will support Terrebonne's efforts to preserve and maintain its unique and valuable wetland.

Attached for your review and information is a copy of Terrebonne Parish's "Barrier Island and Marsh Management Program; Executive Summary". Within this summary, we document Terrebonne's land loss problem and the solutions which the Parish will undertake in order to correct these problems.

Also attached for your review and information is a copy of a resolution which summarizes our comments to Colonel Willis in reference to the public hearing that was held on August 28th concerning to the three Louisiana area initial evaluation studies. This resolution, along with the Executive Summary, constitutes Terrebonne's comments at the public hearing.

We encourage that the Corp continue to work and support the efforts of local governments, and that the Corp study our findings and our plans and proceed accordingly to work jointly with state and local governments in solving the problem which faces Terrebonne Parish and the surrounding wetlands.

If we can be of any assistance to you in the future, or can provide any information to you, please do not hesitate to call.

Sincerely,

J.D. Boudreaux III

J.D. Boudreaux, III
Chairman, Terrebonne Parish Council
TERREBONNE PARISH CONSOLIDATED GOVERNMENT

JDB/JBE/wtm

Enclosure

cc: Colonel Willis, U.S. Army Corp of Engineers

TERREBONNE PARISH

BARRIER ISLAND AND MARSH MANAGEMENT

PROGRAM

EXECUTIVE SUMMARY

Prepared By:

TERREBONNE PARISH GOVERNMENT

James B. Edmonson
Robert S. Jones

July, 1984

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TITLE

I. INTRODUCTION AND IDENTIFICATION OF PROBLEM

Terrebonne is washing away into the waters of the Gulf of Mexico. This land has always been battered, broken up and swept away by the Gulf--but in ages past, it was balanced by the build-up of land created by the flow and seasonal flooding of the Mississippi River and its associated bayous. Today, artificial levees and flood control projects have stopped Mississippi River flooding and the associated build-up of new land. Other man-made activities, such as canalization, oil and gas exploration,

have contributed to the problem. Without the natural build-up of new land by the Mississippi River the effects of wind, waves, currents and tides increase. (Davis, 1983).

These disruptions in the natural cycles of Louisiana's deltaic plain have produced extreme land loss problems for Terrebonne Parish caused primarily by subsidence, erosion and sea level rise.

Over a twenty-three (23) year period from 1955-1978, it was documented that Terrebonne Parish lost fifteen (15%) percent of its land area and forty-two (42%) percent of its barrier islands. (Wicker et al, 1980). At these rates of erosion and those calculated for the main land, all of Terrebonne's erodable land will be gone in 98 years.

To explain the cause of these problems, the Parish developed the following slide show which has been prepared as part of Terrebonne's public relations

program. Over the past two years, the presentation you are about to see has been viewed by thousands, along with an accompanying show at civic club meetings, trade shows and in classrooms. Most recently these presentations have been viewed by coastal scientist and federal staff.

SLIDE SHOW

Terrebonne Parish: The Land, The People, and The Sea

II. PROGRAM GOALS

After identifying its problems, Terrebonne Parish developed goals to address the identified problems. These goals are:

1. To develop additional facts about the barrier islands and our marshes.

2. To draw public attention to and educate them on the problems associated with barrier island and marsh deterioration.

3. To develop and implement programs and plans for the preservation and protection of Terrebonne's multi-million dollar estuary.

4. To reduce the scope of damage to the barrier islands through physical change.

A. TO DEVELOP A COMPREHENSIVE DATA BASE

In the mid to late 1970's, the Parish recognized there was very little information on the subject of shore erosion, subsidence, marsh preservation and restoration of the barrier islands. We realized that to develop an effective program to address our problems it would be necessary to generate such information.

Therefore, from 1978 through 1981, the parish contracted professional assistance to prepare a habitat evaluation of the parish, two (2) barrier island restoration plans, an investigation into the use of dredged materials and a Coastal Zone Management Program document. However, as the Parish learned more about its condition, it became apparent that much more information would be required to solve our precarious situation. In the past several years, the Parish has undertaken or is planning the following programs or studies to develop additional facts about its barrier islands and marshes.

1) Sand Resource Inventory - The gulf bottom around our coastline is being investigated to locate sand resources. This investigation concentrates on identifying sand deposits on the shoreface and inner shelf that are suitable as a source for beach nourishment and dune construction material.

This study is presently being performed by Louisiana State University and the Louisiana Geological Survey under contract to Terrebonne Parish at a cost of $18,000.00. Preliminary results are in and the study will be completed by this fall.

2) Marsh Valuation Study - A marsh valuation study is being conducted to develop economic valuations of Terrebonne Parish wetlands, incorporating traditional and non-traditional values. This will assist the Parish Government in planning coastal protection strategies and will be used as an input into the U.S. Army Corps of Engineers present marsh value studies. Marsh values will indicate federal funding participation in restoration and hurricane protection projects.

This study is presently being performed through the Louisiana Universities Marine Consortium by Louisiana State University and Nicholls State University and is funded by Terrebonne Parish at a cost of $40,000.00.

3) Oyster Contamination Study - An Oyster Contamination Study has been intiated by Terrebonne Parish. This study deals primarily with the question of the sources of sewerage or fecal contamination and the methods used by health authorities in monitoring for fecal contamination. The sources of contamination, harvesting and market alternatives are being investigated.

This study has been funded by the Terrebonne Parish Government and the State of Louisiana at a cost of $80,000.00 and is being performed by the Louisiana Universities Marine Consortium, the Louisiana Department of Health and Human Resources and Nicholls State University.

4) Subsidence Study - A Subsidence Study has been initiated by the Parish. This two (2) year study will classify the marsh and ridge lands as either stable, erosionable or accretional. With this knowledge, the Parish can prioritize and concentrate its management of the marshes and development accordingly.

This study will forecast net subsidence rates, taking into account sea level rise throughout the Parish for 5, 10, 15, 25 and 50 years.

This study has been funded by the Terrebonne Parish Government in the amount of $65,000.00 and is being performed by Louisiana State University and the Louisiana Geological Survey.

5) Ownership Study - A study to identify the ownership of the barrier islands was conducted by the Louisiana State University, Center for Wetland Resources for the amount of $30,000.00.

6) Soil Survey - To update the outdated soil survey for the parish, Terrebonne is proposing a new soil study to aid in determining the health and vitality of the wetlands. This project as proposed will be conducted by the U.S. Soil Conservation Service at a cost to the Parish of $300,000.00.

7) Sea Level Rise Study - To assist the Parish in analyzing and interpreting sea level rise data, the U.S. Environmental Protection Agency is funding a $10,000.00 drainage policy analysis contract.

In the future, Terrebonne intends to closely monitor and study Terrebonne's condition and all barrier island and marsh restoration projects in order to develop needed information on the true cost and effectiveness of such projects.

The following lists the people and organizations instrumental in developing the information obtained to help solve Terrebonne's problems of erosion and subsidence. Close contact and cooperation will have to be maintained between these people in order to effectively solve Terrebonne's problems.

Louisiana Center for Wetland Resources

Louisiana Geological Survey

Louisiana State University

Louisiana Universities Marine Consortium

Nicholls State University

Coastal Environments, Inc.

U.S. Soil Conservation Service

Louisiana Department of Health and Human Resources

Louisiana Department of Natural Resources

U.S. Environmental Protection Agency

U.S. Army Corps of Engineers, New Orleans District Office

Terrebonne Parish Government

B. TO EDUCATE THE PUBLIC

Last year, Terrebonne Parish recognized any effort to combat problems of such magnitude as coastal erosion, land subsidence and sea level rise was going to be long term and expensive. In order to maintain such an effort, the Parish realized that it needed full public cooperation and support.

In an effort to generate such cooperation and support, the Parish has embarked on a major educational program consisting of:

1) Slide Presentations - Recently, the Police Jury developed two (2) slide shows on the Parish's economy and the environment. One of these is the one you saw today. These shows have been so well received that congressional offices have inquired into the purchasing of copies.

2) Handouts - To supplement the slide shows, three (3) brochures were developed for distribution to the general public and the public school system.

3) Billboards - Posters have been designed to convey the importance of preserving our Barrier Islands and marshes. Two of these posters have been displayed on Houma area billboards.

4) Barrier Island Foundation - A foundation has been organized to encourage and support the continuation of efforts to protect and preserve the parish and its inhabitants.

5) School Programs - Most recently, the Parish Government in cooperation with Parish School Board, has developed and implemented an eighth grade curriculum dealing with the subjects of geology, the environment, utilization of renewable and non-renewable resources, erosional problems and solutions. It is hoped by educating our youth, they will grow and live within the Parish with a new sense of values for their environment and its productive potential.

It is hoped they will pass this on to their children. It is also realized the first 8th graders educated will be of voting age in ten (10) years and may be instrumental in supporting a parish tax for preservation purposes.

People and organizations who have been instrumental in developing these programs and with whom coordination must be maintained are:

Nicholls State University

Terrebonne Parish School Board

Coastal Environments, Inc.

LAMAR Billboards, Inc.

Donald W. Davis

Star Printing, Inc.

Terrebonne Parish Government

C. TO PRESERVE THE WETLANDS

Terrebonne Parish has recognized that its wetlands have immense monetary and esthetic value. Presently, Terrebonne's estuary produces over $30 million per year in seafood and recreational income. The Parish is unwilling to abandon its wetlands to the forces of nature. The Parish recognizes that stabilization and preservation of its barrier islands is just the beginning of the effort to save its wetlands. Therefore, plans and programs are now being generated and/ or implemented by both the public and private sectors in an effort to save Terrebonne's wetlands. Some of these programs and projects are:

1. Lake Boudreaux-wave stilling device utilizing old tires
2. Lake Penchant Management Study
3. Louisiana Wildlife & Fishery Montegue Marsh Management Project
4. Jug Lake-shoreline plantings of smooth cord grass
5. Numerous Oil Canals-shoreline plantings of giant cut grass
6. North Falgout Canal Area-3 or 4 fixed crest weirs and 2-10 foot flap gate weirs
7. Barrier Island fertilization projects and soil surveys
8. Mitigation Banking Programs
9. Fresh Water Diversion Plan
10. Parishwide Drainage Plan
11. Hurricane Protection Plan
12. Lower Sarah Forced Drainage Project
13. Coastal Eco-System Management Plan
14. Coastal Use Management Program

D. TO PRESERVE THE BARRIER ISLANDS

Terrebonne's barrier islands are its first line of defense against attack from the sea. If these islands are lost it is predicted that Terrebonne's land loss would accelerate geometrically. The Parish, therefore, has recognized its barrier islands are going to have to be stabilized and preserved if any effort at combating shore erosion and land subsidence is going to be successful.

The state of deterioration which characterizes the barrier islands of Terrebonne Parish, and Isle Dernieres in particular, results from wave action, subsidence, and increasing sand deficiency. Specific erosion rates for the Isles Dernieres chain over a twenty-three (23) year period show this barrier chain lost thirty-three (33%) percent of its total land area; eight (8%) percent of its beach area; forty (40%) percent of its marsh/mangrove habitants and sixty-four (64%) percent of its flats. Shoreline erosion rates averaged thirty-four (34) feet per year (Myer-Arendt and Wicker, 1982).

Much of the shoreline erosion can be attributed to subsidence factors, which include sea level rise, geologic downwarping and compaction due to weight. Isles Dernieres is also experiencing a high sand attrition rate. Islands breached during storms remain fragmentated, and major passes are developed between islands. These breaches, in turn disrupt the transport system of sand and decrease the sediment supply by acting as sediment sinks. The net result of this disruption of sand supply is increased erosion and reorientation of the islands (Meyer-Arendt and Wicker, 1982).

Overall, the islands have been subjected to extensive erosion, breaching, and subsequent opening of tidal inlets, and land loss. Terrebonne is fortunate however, that the extent of erosion caused by severe storms has been minimal over the past several years and we have not been subjected to the erosion forces of a major hurricane. However, if existing forces continued unchecked, all of Terrebonne's barrier islands will be gone in 50 years. Once these islands are lost, the destruction of Terrebonne Parish will accelerate drastically. With the loss of the islands and the estuary, Louisiana, Terrebonne and the nation will lose billions of dollars in renewable resources and recreational industries. In addition, the increased cost of hurricane protection will become staggering for the Terrebonne-Lafourche Metro Area, the United States' newest Metropolitan Statistical Area (MSA) in which approximately 200,000 people reside.

Despite the various physical processes that are contributing to the loss of the barrier islands, remedial measures can be implemented to retard this degredational phase. Various methods have been proposed to stabilize the Barrier Islands and information has been sought to either justify their use or to remove these methods from further consideration.

Structures such as

1. Rip rap
2. Groins
3. Breakwaters and
4. Sea Walls

were once proposed to stabilize the islands. Besides cost, available literature suggested that structural solutions such as groins, rip rap or

detached breakwaters are not generally recommended in areas of high shoreline retreat, unless accompanied by adequate sand nourishment.

Rip rap revetments protect only the land immediately behind them and provide no protection to adjacent areas. And when a groin is built, the sand trapped on its updrift side is no longer available to the downdrift beaches and erosion may result (USACE, 1981). Presently, East Timbalier and Timbalier Islands are being starved of sand by the jettie located at Belle Pass.

In 1975, the U.S. Army Corp of Engineers developed a plan for restorating Terrebonne's coast line (USACE, 1975). Although the alternatives considered were not economically justified at the time and therefore, not eligible for federal participation, analysis indicated that a closure dike alternative was the most satisfactory plan for meeting the planning objectives. However, the report goes on to say, "since the plan does not provide complete protection, other actions that are important to the plan should be implemented including regulation of dredging operations, placement of dredged material, and a beach stabilization program".

Based on the literature available, the parish recognized the need to pursue non-structural solutions. Non-structural alternatives include:

1. Beach Nourishment
2. Dune Construction and Stabilization
3. Back-Barrier Fill and Stabilization and
4. Sand Management Practices.

HOW THE BEACH WORKS

COMPONENT 1 RESPONSE TO : NORMAL WAVE CONDITIONS AND WEAK STORMS

Figure 2a

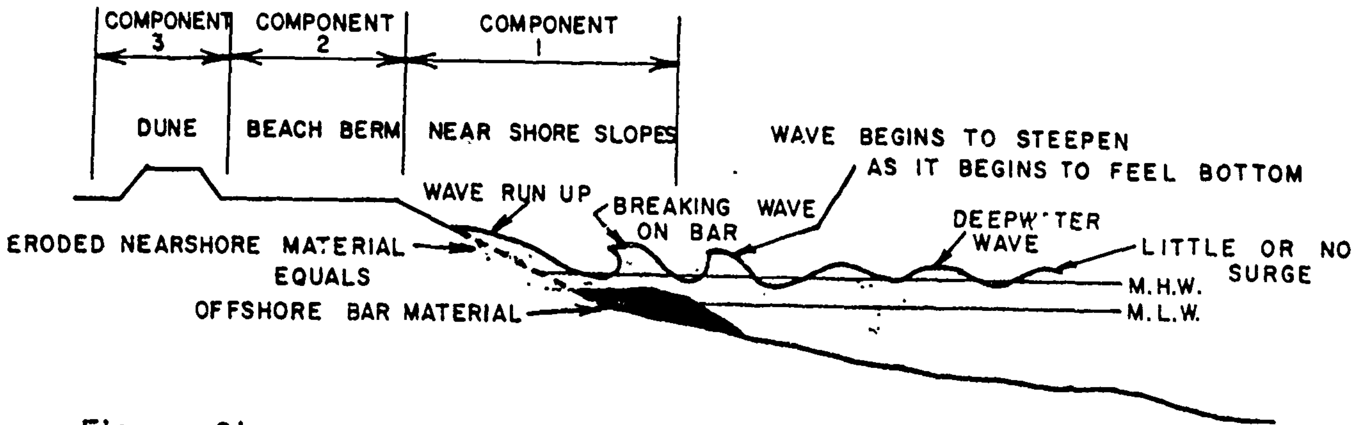
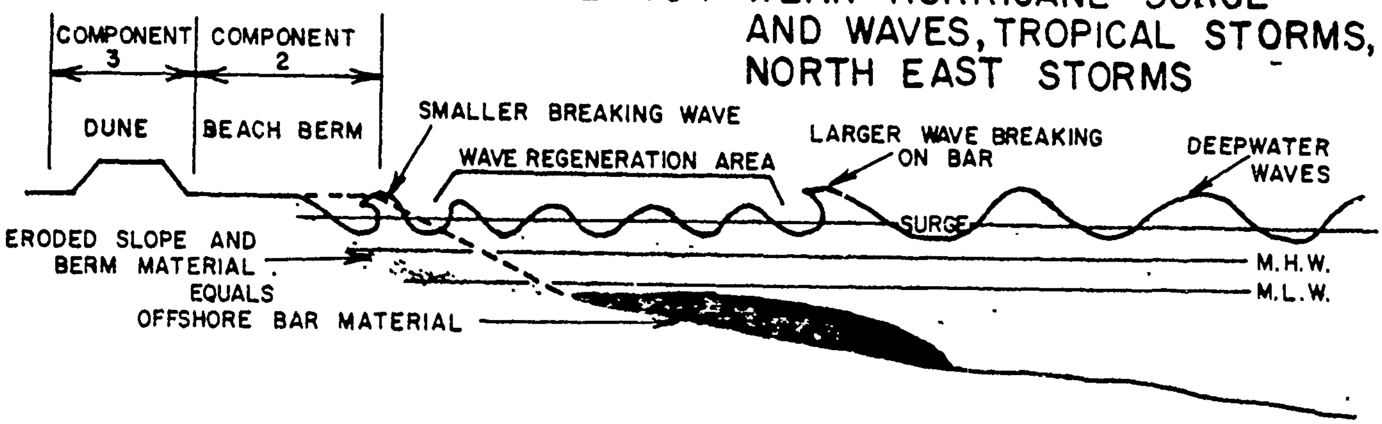


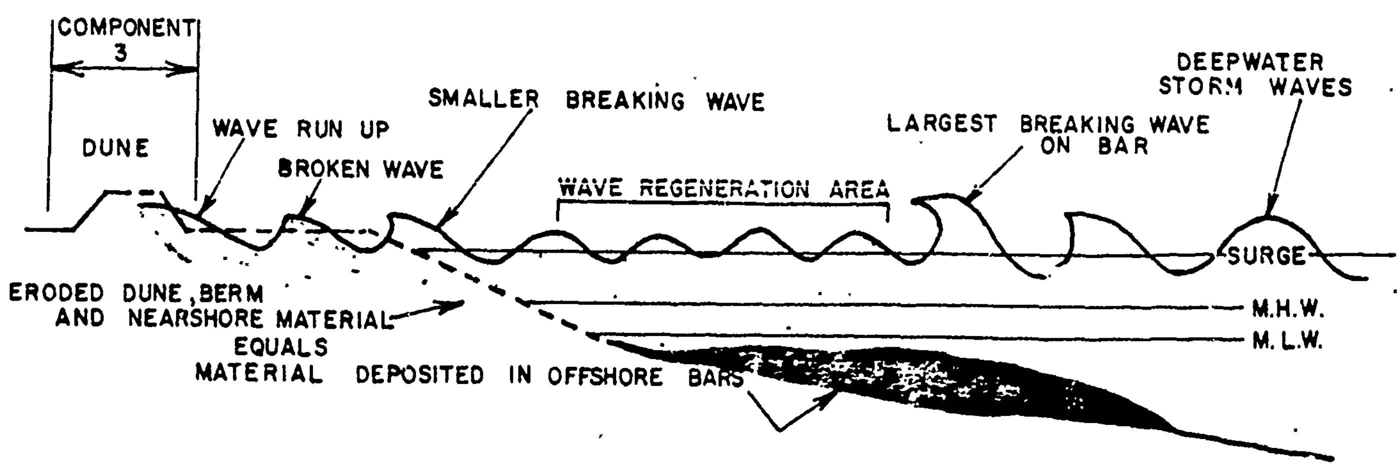
Figure 2b

COMPONENT 2 RESPONSE TO : WEAK HURRICANE SURGE AND WAVES, TROPICAL STORMS, NORTH EAST STORMS



COMPONENT 3 RESPONSE TO : MAJOR HURRICANE SURGE AND WAVES

Figure 2c



The Corp of Engineer's Shore Protection Manual (USACE, 1977) classifies beaches as shore protection structures. It states, "Such beaches disipate wave energy without causing adverse effects". The manual continues with, "When studying an erosion problem, it is advisable to investigate the feasibility of mechanically or hydraulically placing borrow material on the shore to restore or form, and subsequently maintain, an adequate protection beach". The Corp is currently doing this along Grand Isle.

With two opposing solutions facing the Parish efforts were intensified to search the available literature and to fund additional site specific studies. As a result of these efforts, a 1960 report by the Louisiana Department of Public Works printed as House Document 338, 87th Congress, 2nd Session was located. This report concluded, "The only suitable plan for protection of both the Timbalier and Isles Derneires chains would be the artificial nourishment of the beach front with material from the offshore gulf areas".

Then in 1982, the Terrebonne Parish Police Jury completed its first barrier island restoration plan. It states, "Shoreline erosion can be retarded by nourishing the beaches with introduced coarse sediments, and the loss of sand can be reduced by sealing off breaches and washovers and installing sand-trapping jetties in locations where longshore-migrating sand enters major sink areas". (Meyer-Arendt and Wicker, 1982).

In 1983, Terrebonne's second restoration plan was completed. The staff took this information and began to develop projects and design additional studies. To date these projects include:

1. Use of Cat Island Pass Dredge Material for Eastern Isle Dernieres Restoration Project.

Over the last 18 years the U.S. Army Corps of Engineers has contracted for eleven dredging projects of the Houma Navigational Canal in Cat Island Pass. In each of these projects, disposal of the dredged material has occurred in a designated subaqueous spoil area immediately adjacent to the Canal. Cat Island Pass is again scheduled for dredging in the summer of 1984. Terrebonne Parish proposes this years' dredge material be used for barrier island restoration at Eastern Isles Dernieres, approximately 5 miles to the west of the Houma Navigational Canal.

Approximately 440,000 yd^3 of material will be hydraulically transported from the dredge site and used as back bay fill to seal an existing washover at the eastern end of Eastern Isles Dernieres.

2. Back Barrier Fill on Eastern and Central Isles Dernieres.

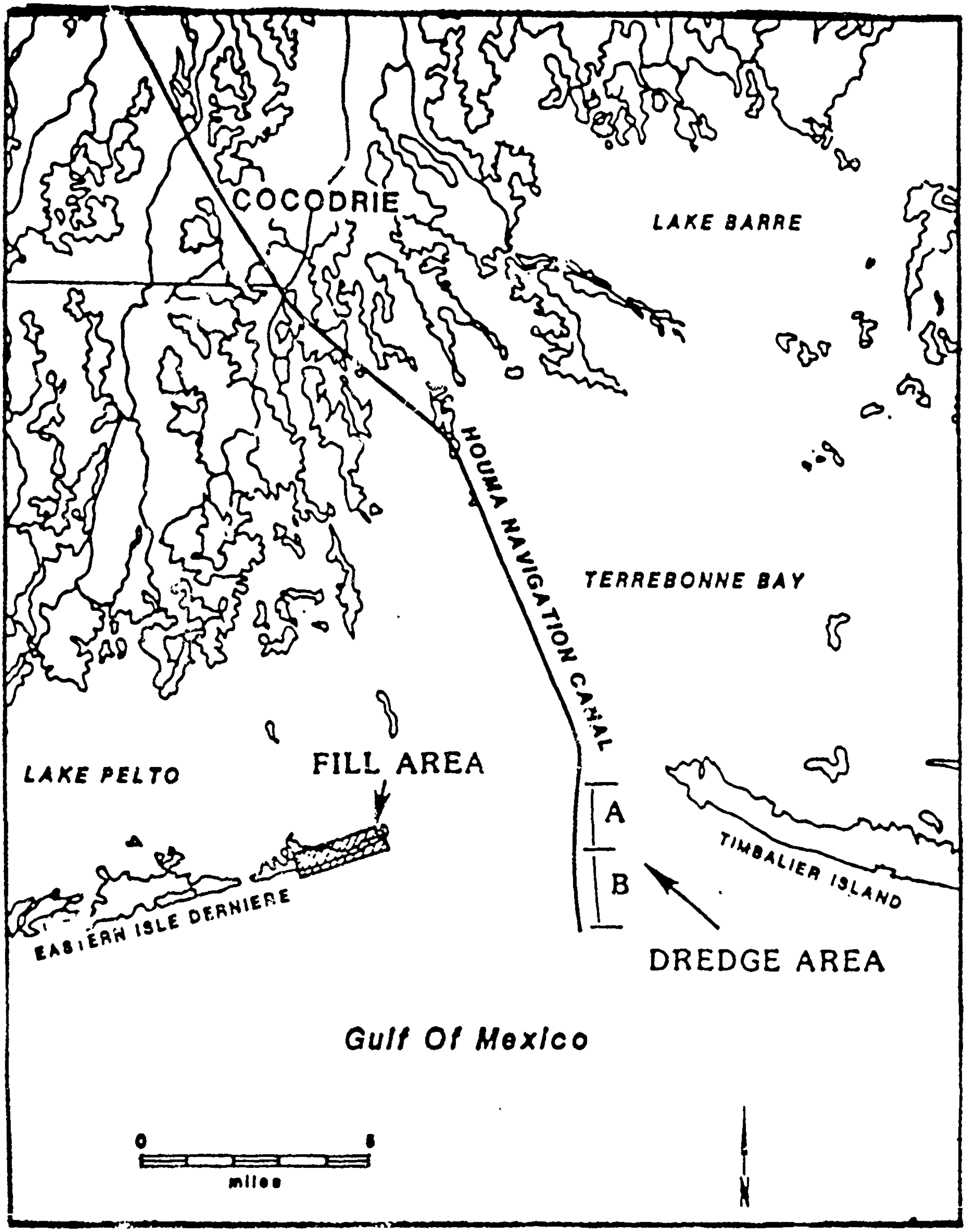
Terrebonne Parish plans to create back barrier marshes in six critical areas on Eastern and Central Isles Dernieres. Approximately 100 acres of back barrier marsh will be created by building up existing low dune and washover areas to a height compatible with the adjacent dunes and then placing locally dredged material behind the new beach dunes. This dredge material will be placed to elevations suitable for colonization by marsh grass and mangrove.

3. Beach Nourishment of Eastern Isles Dernieres.

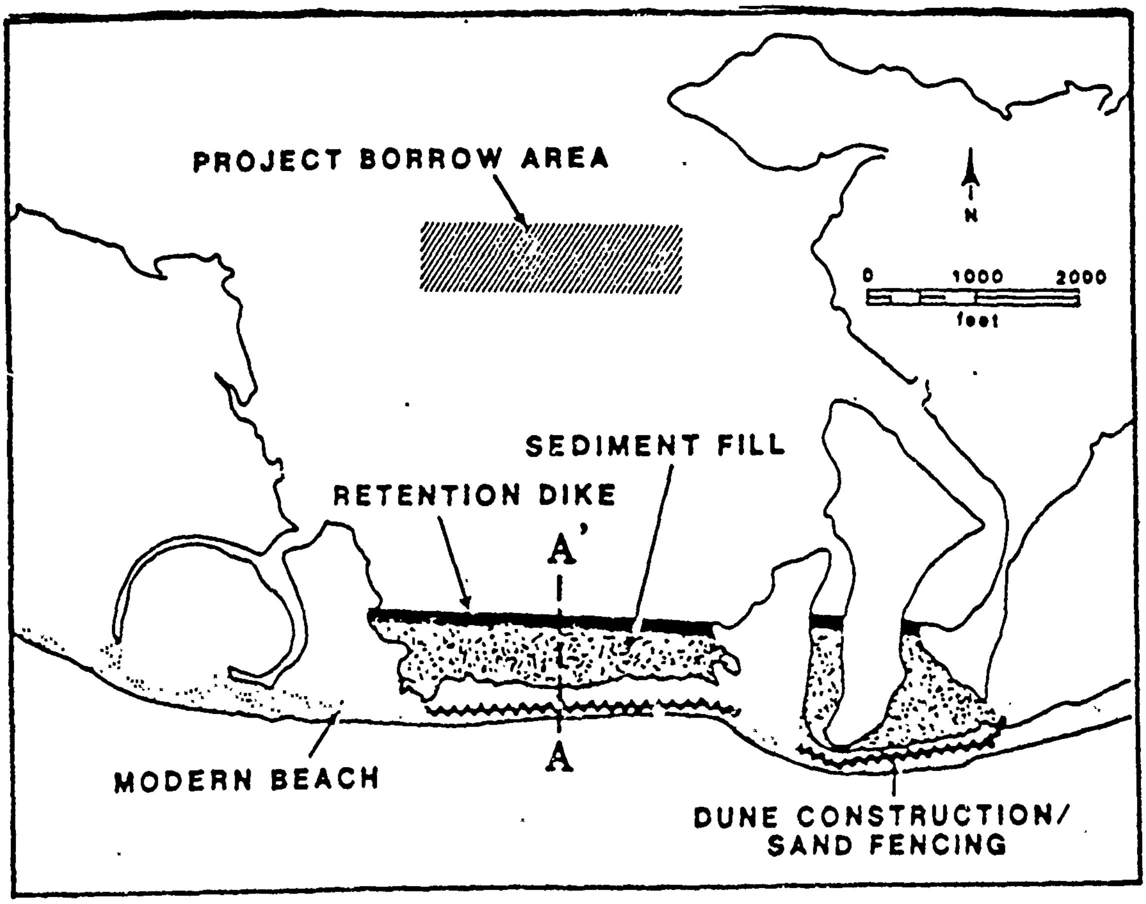
Terrebonne proposes to build a small sand ridge approximately four (4) feet high at its crest and approximately 100 feet wide on the beach of Isles Dernieres from Carmen Cut to Whiskey Pass. This sand emplacement would add outside sand to the Isles Dernieres system. It is anticipated that this sand would be used by natural systems to build offshore bars and beach for shore protection. In addition, the four (4) foot ridge would resist some washover that is occuring now. Vegetation would be planted on this ridge in a further effort to stabilize this beach system.

4. Sand Recycling System.

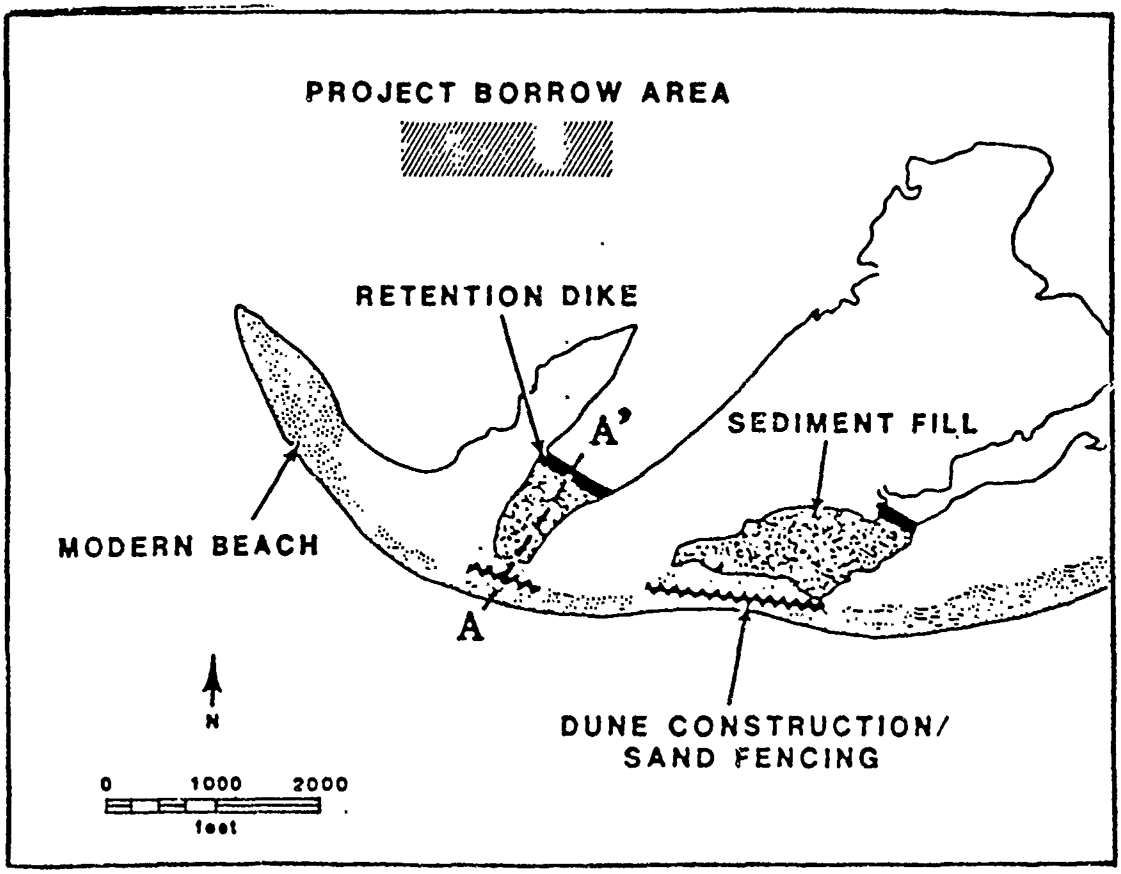
Terrebonne Parish intends to complete a sand recycling system to help preserve the Isles Dernieres chain upon completion of the previously mentioned projects. This system would consist of small jetties placed at the ends of Eastern and Central Isles Dernieres to trap migrating sand and the purchase of a small hydraulic dredge to recycle the trapped sand back onto the islands' beaches.



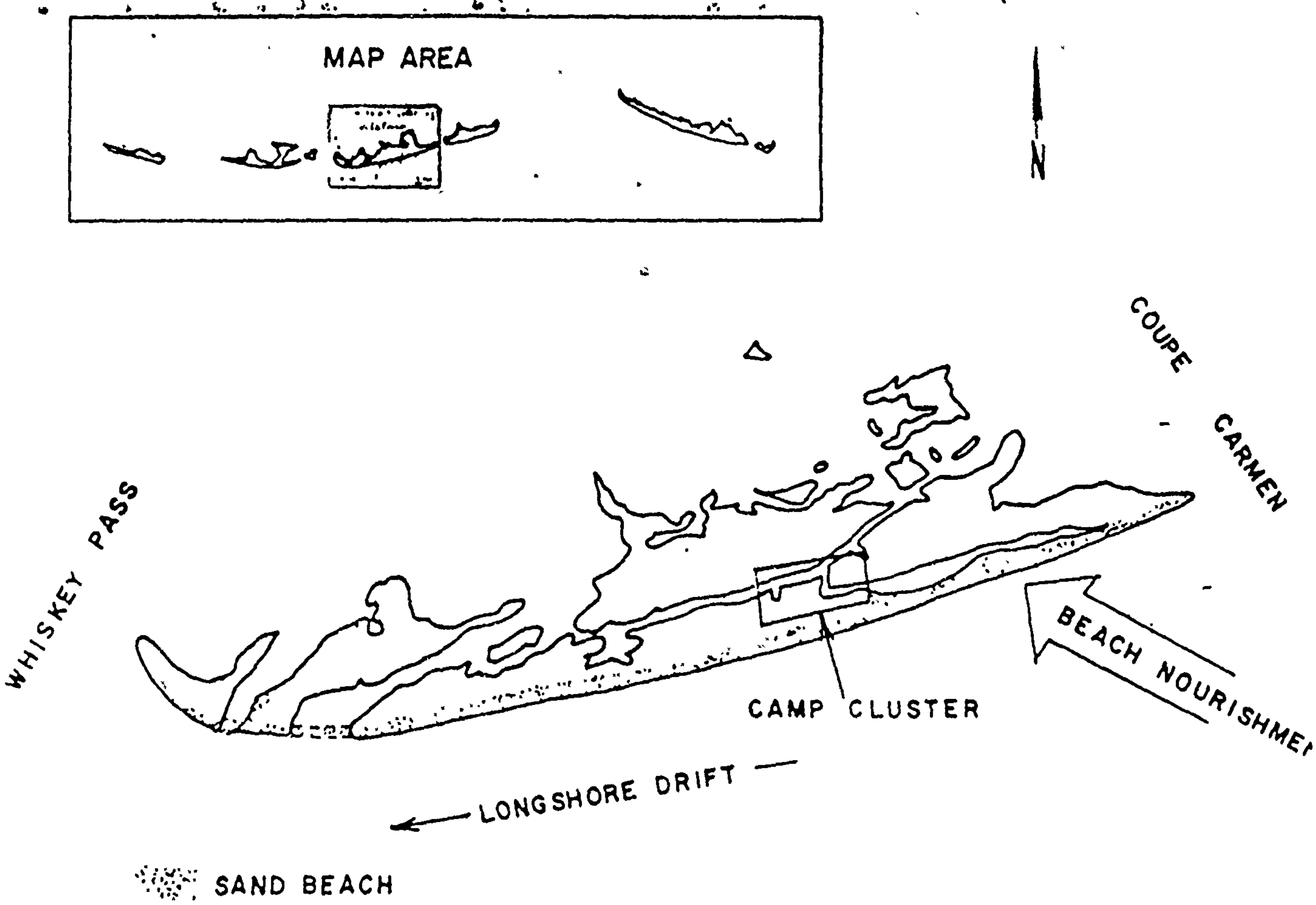
VICINITY MAP SHOWING LOCATION OF PROPOSED FILL AND DREDGE AREA FOR THE USE OF CAT ISLAND PASS DREDGE MATERIAL ON EASTERN ISLE DERNIERE.



PROJECT SITE MAP SHOWING PROPOSED WORK ELEMENTS FOR BACK BARRIER MARSH CREATION ON CENTRAL ISLE DERIERES.



PROJECT SITE MAP SHOWING TWO OF THREE PROPOSED WORK ELEMENTS FOR BACK BARRIER MARSH CREATION ON EASTERN ISLE DERNIERES.



EASTERN ISLES DERNIERES
BEACH NOURISHMENT PROJECT

1:50,000

0 1 2 mi

0 1 2 km

People and organizations who have been instrumental in developing these projects include:

Congressman Billy Tauzin

Congressman John Breaux

Senator J. Bennett Johnston

U.S. Soil Conservation Services

U.S. Army Corp of Engineers, New Orleans District Office

San Fransisco District Office

Mobile District Office

Jacksonville District Office

Waterway Experiment Station

U.S. Environmental Protection Agency

U.S. Department of Interior, Mineral Management Service, New Orleans, Los Angeles

Louisiana Center for Wetland Resources

Louisiana Geological Survey

Louisiana State University

Louisiana Department of Natural Resources

Louisiana Department of Transporation and Development, Office of Public Works

Coastal Environments, Inc.

Great Lakes Environmental Marine, Ltd.

Tenneco-LaTerre, Inc.

Louisiana Land and Exploration Company

Great Lakes Dredging Company

T.L. James, Inc.

T. Baker Smith and Sons, Inc.

Terrebonne Parish Government

III. CAPITAL CONSTRUCTION BUDGETS

Until the Corp completes its current investigation of Louisiana's wetlands and until federal participation in the Corp's closure dike program is justified, Terrebonne Parish intends to implement the Corp's, DOTD's, Coastal Environment's, Louisiana Geological Survey's and the Parish Staff's recommended actions of beach nourishment and stabilization. The first actions the Parish will undertake are the four (4) island restoration projects presented earlier in this report. In addition, the Parish has gathered and developed preliminary information to generate a twenty-five (25) year budget to plan, design and construct a comprehensive marsh management and hurricane protection program for Terrebonne Parish.

Following are budgets for a twenty-five year program. Today's emphasis is placed on the five (5) year and ten (10) year budgets for this program.

The buuget for the first five years of the program depicts costs associated with the implementation of the projects described previously, including:

1. Cat Island Pass Use of Dredged Material
2. Back-barrier fill on Eastern and Central Isles Dernieres
3. Beach Nourishment of Eastern Isles Dernieres
4. Sand Recycling System

5 YEAR CAPTIAL BUDGET

AMOUNTS EXPRESSED IN THOUSANDS

PROJECTS	1984	1985	1986	1987	1988	TOTAL
Dune Construction	200	360	1,500		200	2,260
Back-Barrier Fill	600	740	1,500			2,840
Stabilization		150		700		850
Beach Nourishment				1,775	300	2,075
Sand Retention		500				500
Equipment/Maintenance					3,000	3,000
Montioring	100	50	50	50		250
Studies/Design	100	100	50	50	100	400
TOTAL	1,000	1,900	3,100	2,575	3,600	12,175

Beginning in 1984, material dredged from Cat Island Pass will be used to repair a wash-over fan on Eastern Isles Dernieres, followed by back-barrier fill and sand retention projects in 1985. In 1986, numerous wash-over fans will be repaired on Eastern Isles Dernieres followed by a protective beach nourishing of the Isles in 1987. To maintain the projects implaced in the four previous years, in 1988, the parish plans to purchase a small maintenance suction dredge. These projects, coupled with the State's closure of Carmen Cut will enable the Isles Dernieres chain to be stabilized and maintained with periodic nourishment, barring any damage caused by a tropical storm.

The second budget covers costs for the five year period beginning in 1989 and running through 1993. Again, as in the first five (5) year program, the second five (5) years is characterized by fill, stabilization and beach nourishment. Most of this work includes the introduction of sand retention devices to assist the maintenance dredge and, the design of a parish wide hurricane protection project.

SECOND 5 YEAR BUDGET

AMOUNTS EXPRESSED IN THOUSANDS

PROJECTS	1989	1990	1991	1992	1993	TOTAL
Dune Construction		200		200		400
Back-Barrier Fill		500		500		1,000
Stabilization	50	100			100	250
Beach Nourishment		500			500	1,000
Sand Retention	1,000	200				1,200
Equipment/Maintenance	500	500	500	500	500	2,500
Monitoring	50	50	50	50	50	250
Studies/Design			250	250	250	750
TOTAL	1,600	2,050	800	1,500	1,400	7,350

The remaining fifteen (15) year budget covers the years beginning in 1994 and ending in 2010 with the realization of a controlled estuary and hurricane protection system. This system will utilize a three (3) barrier control system consisting of the barrier islands and two levees. With the completion of this system the threat of sea level rise and tropical storms will be minimized.

LAST 15 YEARS BUDGET

AMOUNTS EXPRESSED IN THOUSANDS

PROJECTS	1994-1997	1998-2001	2002-2005	2006-2010	TOTAL
Barrier Island					
Maintenance	2,000	2,000	2,000	2,000	8,000
Levee Construction	26,880	26,880	26,880	26,880	107,520
Flood Gates	15,000	7,500	7,500	7,500	37,500
Water Controls	1,000	1,000	1,000	1,000	4,000
Monitoring	200	200	200	1,000	1,600
Studies/Design	500	500	500	500	2,000
TOTALS	45,580	38,080	38,080	38,080	160,620

Combining the totals of each budget results in a twenty-five (25) year system cost of $180,145,000. These costs are expressed in 1980 dollars and therefore, do not take into account inflation over the twenty-five (25) year period. Also, and most importantly, these figures reflect solutions for a specific situation in a constantly and rapidly changing environment. Because of this any program has to be extremely flexible.

25 YEAR TOTALS

AMOUNTS EXPRESSED IN THOUSANDS

PROJECTS	TOTAL
Dune Construction	2,660
Back-Barrier Fill	3,840
Stabilization	1,100
Beach Nourishment	3,075

PROJECT	TOTAL
Sand Retention	1,700
Equipment/Maintenance	13,500
Levee Construction	107,520
Flood Gates/Water Controls	41,500
Monitoring	2,100
Studies/Design	3,150
TOTAL	180,145

Although Terrebonne has spent and allocated over $1.3 Million of local funds over the past several years to combat erosion, solutions are beyond our capacity. For this reason, it is hoped that the State of Louisiana will choose to support Terrebonne's effort to preserve its barrier islands and, as you will soon hear, its valuable wetland resources.

Sources of funding for the proposed projects are summarized accordingly:

SOURCES	1984-1988	1989-1993	1998-2010	TOTAL
Local	3,000,000	2,500,000	11,600,000	17,100,000
State	9,175,000	4,850,000	30,000,000	44,125,000
Federal	-0-	-0-	119,020,000	119,020,000
TOTAL	12,175,000	7,350,000	160,620,000	180,145,000

IV. ECONOMIC JUSTIFICATION

Louisiana's 6.5 million acres of wetlands constitute 40% of the nations marsh ecosystem. Ten percent of these Louisiana wetlands are located in Terrebonne Parish. These wetlands are a vast, unique, natural factory for the production of renewable resources and the location of much of its mineral resources.

Louisiana's shrimp production has been estimated to be worth approximately 50 million dollars annually. The oyster catch in Louisiana has a yearly value between three and four million dollars.

Louisiana's Mississippi River delta has been determined to be one of the nation's most productive menhayden fishing areas. In its early life, menhayden are dependent on an esturine environment for survival. Being king by weight, "the menhayden catch has made the ports of Cameron, Empire-Venice and Dulac-Chauvin among the top five fishing ports in the United States. Combined, these ports account for more that 850 million pounds, which represent more than $80 million in annual income" (Davis, 1984).

Louisiana's fur industry accounts for as much as 65% of the nation's fur harvest. The value of this harvest varies greatly from year to year. Its yearly value is estimated to be between $2 million and $24 million annually.

Terrebonne Parish's wetlands are conservatively estimated to produce seafood and fur products valued annually at 13.5 million dollars.

The hunting and fishing recreation industry contributes $175 million to $200 million to the state economy. Ten to twenty percent of this industry is located in Terrebonne Parish.

In addition to her renewable resources, much of Louisiana's non-renewable resources lie within its wetlands. Much of this mineral wealth is represented by the production of oil and gas. Terrebonne is one of Louisiana's top oil and gas producing parishes.

In spite of proposed legislation, the base line for determination of the Federal-State boundary is considered as an ambulatory line. Recently, the state has been advocating increased Louisiana participation and revenues from Section 8-G lands.

The present Federal-State boundary is based on a 1953 photo survey of the Louisiana Coast Line. As emphasized in this presentation and other references, the shoreline has eroded considerably during the last 30 years so the boundary based on 1984 data would be considerably landward from that which is in use today.

If nothing is done to reduce shore line erosion, the Federal-State boundary, if resurveyed, will continue to move northward and reduce Louisiana's participation in petroleum industry income. If an island such as Isle Derniere were lost, dramatic changes in the Federal-State boundary would result along with decreased state and local revenues.

As can be seen, Terrebonne Parish's wetlands are of immense value, particularly to the state of Louisiana. The average projected expenditure per year for the 25 year program to protect this valuable ecosystem is 7.2 million dollars. The maximum yearly budgeted expenditure in the first five years of this program is two million dollars. Compare this to Terrebonne's estimated 13.5 million dollar seafood and fur production. This favorable comparison does not even consider the value of Terrebonne's wetlands to the oil and gas industry or its sport fishermen and hunters.

V. <u>CONCLUSION</u>

Man has no control over the natural processes that have for centuries affected the coast. The man-made elements that have altered flow regimes, sediment patterns and vegetative assemblages have created a problem. The wetlands are out of balance. Land loss forces now supercede constructive forces thus threatening the jobs, industries and lifestyles of the people whose lives are tied directly or indirectly to the coast. The final question is: "Can we afford the loss?" (Davis, 1984)

We, of Terrebonne Parish feel the only answer to this question can be <u>No</u>. It is hoped that the State of Louisiana would feel the same and support Terrebonne's efforts to preserve and maintain its unique and valuable wetland.

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OFFERED BY: Mr. W. Henry.
SECONDED BY: Mr. W. Bonvillain, Jr.

RESOLUTION NO. 84-0939

A Resolution offering comments on the U.S. Army Corps of Engineers initial evaluation study on water supply, land loss and marsh creation and shore and Barrier Island erosion.

WHEREAS, the Corps of Engineers has scheduled public hearing to receive comments on said matter, and

WHEREAS, these initial studies determine the focus of future feasibility studies, and

WHEREAS, the Terrebonne Parish Government has been strongly concerned with the state of deterioration of its environment, and

WHEREAS, that although the Corps of Engineers must be commended for taking these directions and are encouraged to continue their research, the parish feels that the information presented in the Notice of Findings for each study is incomplete and insufficient to support the conclusion, and

WHEREAS, the parish has determined that the only successful long term approach to curing the symptoms of larger problems is to address the problem of the total eco-system, and

WHEREAS, the Terrebonne Parish Government has developed a program to identify, address and manage the problems of its eco-system.

NOW, THEREFORE BE IT RESOLVED that the Corps continues its research but re-evaluates all alternatives presented in the initial studies during the feasibility stage; and,

BE IT FURTHER RESOLVED that these evaluations be closely tied to existing local government plans, studies and reports and that the future feasibility studies be conducted with close cooperation with local government; and,

BE IT FURTHER RESOLVED that the Corps respond to the following questions concerning the initial studies:

1. In all studies, how were annual project cost, both construction and maintenance, calculated and over what period of time?

2. In all studies, how were project benefits calculated, what values were used and over what period of time?

3. Did the salt water barrier alternative under the water supply study take into account its value to protect against erosion?

4. Did the marsh creation and barrier island studies examine the use of material dredged u[illegible] the Corps maintenance dredging operation?

THERE WAS RECORDED:

YEAS: P. Gabriel, Sr., N. Bolden, Davidson, A. Bonvillain, B. Bonvillain, N. Bergeron, Jr., L. Klingman, Jr., R. Bergeron, W. Bonvillain, Jr., U. Guidry, R. Domangue, W. Henry, C. Bodden and C. Duet.

NAYS: None.

NOT VOTING: J. D. Boudreaux III.

ABSENT: None.

The Chairman declared the Resolution adopted on this 22nd day of August, 1984.

* * * * * * * * * *

I, PAUL A. LABAT, Clerk of the Council of Terrebonne Parish, Louisiana, do hereby certify that the foregoing is a true and correct copy of a Resolution adopted by the Council in Regular Session on August 22, 1984, at which meeting a quorum was present.

GIVEN UNDER MY OFFICIAL SIGNATURE AND SEAL OF OFFICE THIS 23rd day of AUGUST, 1984.

Paul A Labat

PAUL A. LABAT
COUNCIL CLERK
TERREBONNE PARISH COUNCIL

27 August 84

GENTLEMEN:

MY NAME IS STUART GUEY AND I AM A MEMEBER OF THE PLAQUEMINES PARISH COMMISSION COUNCIL REPRESENTING THE BELLE CHASSE AREA. TONIGHT WE ARE ASKED TO COMMENT ON THREE AREAS WHICH THE U.S. ARMY CORPS OF ENGINEERS HAS PERFORMED AN INITIAL EVALUATION STUDY. THE THREE AREAS, HOWEVER, COULD BE COMBINED FOR THEY ALL RELATE SO CLOSELY TO ONE ANOTHER. EACH OF THESE PROJECTS ARE VITAL TO THE WELL-BEING AND FUTURE TO THE PEOPLE OF PLAQUEMINES PARISH WHO EARN THEIR LIVING EITHER DIRECTLY OR INDIRECTLY FROM TWO SPECIFIC AREAS.

THE FIRST AREA BEING THAT OF THE VAST RENEWABLE RESOURCE BASE WE HAVE IN PLAQUEMINES PARISH and THE PEOPLE WHO USE THE MARSH SYSTEM AS THEIR SOURCE

the non-renewable resource base + mineral

OF INCOME. AND SECOND, THE PEOPLE WHO RELY ON THE OIL AND GAS INDUSTRY FOR THEIR LIVELIHOOD. THE FUTURE OF BOTH GROUPS RELIES ON EXACTLY WHAT WE'RE DISCUSSING TONIGHT, THE FIRST GROUP BY THE RESOURCES PROVIDED FROM THE MARSHLANDS AND BOTH GROUPS BY THE INVALUABLE AMOUNT OF HURRICANE AND STORM SURGE PROTECTION AFFORDED TO ~~OUR~~ HOMES AND BUSINESSES BY THE MARSH SYSTEM.

THEREFORE, IT IS VITAL THAT YOU, THE CORPS THOROUGHLY ASSIMILATE ANY AND ALL INFORMATION POSSIBLE, NOT ONLY AT PUBLIC HEARINGS BUT THROUGH THE INPUT OF THE MANY USER GROUPS WE HAVE HERE IN PLAQUEMINES PARISH. YOUR SUCCESSES WILL INCREASE AND ANY RESISTANCE YOU MAY ~~RECEIVE~~ encounter WILL BE DECREASED DUE TO THE INVOLVEMENT ~~AND~~ and EDUCATION OF THOSE PEOPLE MOST AFFECTED BY THESE PROJECTS. I MUST RELATE TO YOU THE SITUATION AT CAERNARVON. YOU HAVE DONE AN OUTSTANDING JOB IN MANY ASPECTS OF THIS PROJECT BUT IT SEEMS YOU MISSED THE BOAT ON ONE

land owners, fisherman, recreation, oyster growers

POINT. THAT POINT BEING THE ABSENCE OF THESE USER GROUPS DURING MANY OF THE PAST PRELIMINARY AND PRESENT INTERMEDIATE PLANNING SESSIONS. MAYBE YOUR POLICY DICTATES THAT PUBLIC INVOLVEMENT BE ONLY FROM PUBLIC HEARING - IF THAT IS THE CASE SOMEONE SHOULD CHANGE THE POLICY. AS EARLY IN THE GAME AS POSSIBLE, IT

IS imperative THAT YOU RECEIVE THE MAXIMUM AMOUNT OF INPUT FROM THOSE PEOPLE WHO ARE most DIRECTLY IMPACTED AND I HOPE THAT YOU CONSIDER A METHOD OF INVOLVING THE PEOPLE OF PLAQUEMINES PARISH THOUGHOUT ~~THE~~ these PROJECTS.

ANOTHER POINT WHICH MUST BE ADDRESSED:

YOU MENTION THAT DURING THE COURSE OF YOUR STUDY YOU HAVE FOUND THERE TO BE A LACK OF AVAILABLE INFORMATION. I FIND THIS EXTREMELY HARD TO BELIEVE. IN A LETTER TO COLONEL ROBERT LEE ON OCTOBER 19, 1983, COMMISSIONER MICHAEL KIRBY AND I OFFERED ANY ASSISTANCE POSSIBLE IN THE WAY OF PROVIDING DATA. THE PURPOSE OF THIS WAS TO ELIMINATE, AS MUCH AS POSSIBLE, ANY DUPLICATION OF EFFORTS. LATER I WAS ADVISED BY TELEPHONE THAT THE CORPS HAD OBTAINED MOST OF THE INFORMATION WHICH HAD BEEN PUBLICLY DOCUMENTED AND WAS SEARCHING FOR ANY ADDITIONAL DATA WHICH MAY HAVE BEEN MISSED. I HOPE THAT IT IS NOT THE POSITION OF THE CORPS TO USE EXISTING DATA ONLY TO FORM A BASIS FOR ANOTHER TIME-CONSUMING CORPS ORIENTED STUDY. AGAIN, I RELATE TO CAERNARVON. AT PRESENT I HAVE BEEN INFORMED THAT THE CORPS IS GOING TO SET UP A PRE-CONSTUCTION AND POST-CONSTRUCTION MONITORING PROGRAM FOR THE CAERNARVON PROJECT. IN SPITE OF THE FACT THAT THE PLAQUEMINES PARISH COMMISSION COUNCIL HAS HAD A MONITORING PROGRAM IN EFFECT IN THIS AREA FOR MANY YEARS AND PRESENTLY HAS AN OUTFALL MANAGEMENT PLAN WITH DATA WHICH COULD BE VERY USEFUL AND SAVE TIME. I HOPE MY POINT IS WELL TAKEN THAT ADDITIONAL TIME CONSUMING STUDIES MAY BE UNWARRANTED, FOR THERE ARE VOLUMES AND VOLUMES OF DATA AVAILABLE WHICH WILL DEFINITELY AID IN SPEEDING UP THIS PROCESS.

* I'm sure that by utilizing what Plaq. Parish has to offer that the 1.3 million cost of your monitoring program could be significantly reduced.

ANOTHER ISSUE WHICH WILL AID TREMENDOUSLY IN VALIDATING ANY OF THESE PROPOSALS BY INCREASING THE ECONOMIC BENEFIT AFFORDED, THIS BEING "THE TRUE VALUE OF THE MARSH." BY YOUR OWN STATEMENT YOU ADMIT THAT THIS VALUE HAS NOT YET BEEN DETERMINED. LET ME TELL YOU, WHEN YOU ACTUALLY TAKE INTO CONSIDERATION THE ADVERSE IMPACT A DETERIORATED MARSH WILL HAVE ON OUR RENEWABLE RESOURCE BASE, THE OIL + mineral GAS INDUSTRY, THE LIVEABLE LAND AREA, RECREATIONAL

ACTIVITY, AND THE AMOUNT OF HURRICAN PROTECTION AFFORDED, YOU WILL FIND THE VALUE OF AN ACRE OF MARSH TO SKYROCKET AND THE ECONOMIC FEASIBILITY OF THESE PROJECTS to ~~WILL~~ BECOME MORE FAVORABLE. PLEASE ALSO REALIZE THE RIPPLE EFFECT WE'RE DISCUSSING HERE; THE LOSS OF INCOME, NOT ONLY TO PLAQUEMINES PARISH BUT IN TURN TO THE STATE OF LOUISIANA AND EVENTUALLY THE NATION AS A WHOLE.

ALL OF THESE AREAS I HAVE JUST DISCUSSED WERE BROUGHT TO YOUR ATTENTION TO MAKE A SINGLE POINT. THAT POINT BEING TIME, WE DON'T HAVE MUCH TIME. CAERNARVON DISCUSSIONS BEGAN OVER 20 YEARS AGO AND CONSTRUCTION SHOULD BE COMPLETED SOME 26 YEARS FOLLOWING THOSE DISCUSSIONS. WE DON'T HAVE 26 YEARS. I IMPLORE YOU TO WORK CLOSELY WITH US HERE IN PLAQUEMINES PARISH FOR WE CAN AFFORD MANY SERVICES THROUGH NOT ONLY THE COMMISSION COUNCIL BUT THROUGH UNDOCUMENTED KNOWLEDGE OBTAINABLE THROUGH ACTIVE PUBLIC INVOLVEMENT AND PARTICIPATION WHICH WILL EXPEDITE MATTERS AND MAKE FOR A MORE SUCCESSFUL PROJECT.

BRIEFLY LET ME POINT OUT A FEW SPECIFICS ON EACH OF THESE AREAS:

1) MARSH CREATION

SPECIFICALLY, PLEASE STUDY THE AREA OF THE JUMP IN VENICE. FROM MAPS of this vicinity I HAVE SEEN, WHICH GO BACK AS FAR AS 1894, THERE SEEMS TO HAVE BEEN A TURNAROUND FROM A MARSH BUILDING AREA TO A MARSH DETERIORATING AREA SOMEWHERE IN THE LATE 1950'S. IT IS MY UNDERSTANDING THAT in the mid 50's A SILL WAS PLACED ACROSS THE JUMP AREA AT APPROXIMATELY -20 FEET FOR THE PURPOSE OF DIVERTING SEDIMENT DOWN THE RIVER. LOOK INTO THE FEASIBILITY OF REMOVING THIS OBSTRUCTION SO THAT THIS AREA MAY REVERT BACK TO THE WAY NATURE HAD THINGS PLANNED. BECAUSE OF THE PRESENT DETERIORATED CONDITIONS IN THIS AREA, THE OYSTER INDUSTRY HAS SUFFERED GREAT LOSSES DUE TO THE INFLUX OF TOO MUCH FRESHWATER DURING HIGH RIVER. PRIOR TO THE SILL CONSTRUCTION WHEN THIS AREA WAS STABLE, THE FRESHWATER MADE ITS WAY VIA TIGER PASS AND GRAND PASS TO THE GULF OF MEXICO. BECAUSE OF THE CHANGES OCCURRING TODAY OF FRESHWATER IMPACTING AND KILLING

SALTWATER MARSH, WE NO LONGER HAVE THE NATURAL SYSTEM of sedimentation WHICH ONCE PROTECTED THE AREAS BEHIND BURAS AND BOOTHVILLE FROM THIS EXCESS FRESH WATER. IT WOULD SEEM ALOT CHEAPED TO USE AN EXISTING AREA WITH MARSH BUILDING CAPABILITIES THAN TO BUILD A DIVERSION WITH A POSSIBLE COST OF 14-74 MILLION DOLLARS, DEPENDING ON THE SIZE, WHICH WOULDHAVE A USEFUL LIFE OF ONLY 15 YEARS.

AS TO WATER SUPPLY - PLANS OF POSSIBLY INCORPORATING THE DAVIS POND AND CAERNARVON STURCTURES TO BE USED AS A 15 DAY STORAGE RESERVOIR IN THE EVENT OF A HAZARDOUS WASTE SPILL MAKING ITS WAY DOWN THE RIVER SEEM VERY FEASIBLE. AS TO A RESERVOIR IN THE EAST POINT-A-LA-HACHE AND BOOTHVILLE AREAS, WHAT OF THE STATUS OF THE PROPOSED 55 FOOT CHANNEL DEEPENING of the Miss. River.? MONIES WERE APPROPRIATED TO BUILD RESERVOIRS IN EAST AND WEST POINTE-A-LA-HACHE TO SERVE AS MITIGATION FOR THE EXCESS SALT WATER EXPECTED FROM THE RIVER DEEPENING. WE MUST ~~KNOW~~ investigate as to HOW THESE TWO PROPOSALS FOR RESERVOIR CONSTRUCTION INTERRELATE.

IN ESSENCE WE ARE BEING TOLD THAT ONE, "YOU IN PLAQUEMINES PARISH WILL BE IMPACTED BY THE RIVER-DEEPENING PROJECT AND SECOND THAT THE MISSISSIPPI RIVER WILL MORE THAN LIKELY BECOME MORE POLLUTED, ~~[illegible]~~ [illegible] UNLESS E.P.A. DOES ITS JOB AND CLEANS UP THE WATER." IN BOTH INSTANCES THE TAX PAYERS OF PLAQUEMINES PARISH WILL HAVE TO PAY FROM IMPACTS RECEIVED BOTH UPSTREAM AND DOWNSTREAM.

ON THE ISSUE OF SHORELINE AND BARRIER ISLAND PROTECTION, THERE IS A 25-MILE AREA FROM SANDY POINT TO 4-BAYOU PASS WHICH NEEDS IMMEDIATE ATTENTION AND WAS NOT ADDRESSED IN YOUR INITIAL EVALUATION STUDY. IF WE RANK AREAS IN THE ORDER OF THEIR BARRIER ISLAND AND SHORELINE DETERIORATION, YOU CAN LIST FIRST THE CHANDELIER ISLAND CHAIN, SECOND THE TIMBERLIER AND GRAND ISLAND AREA, AND THIRD THIS 25-MILE STRIP WHICH WAS MENTIONED ABOVE. IT WOULD SEEM RATHER THAN WAIT FOR THIS AREA IN PLAQUEMINES PARISH TO DETERIORATE TO THE EXTENT OF THE TWO OTHER ABOVE MENTIONED AREAS THAT IT WOULD BE LESS COSTLY TO ADDRESS THIS AREA NOW BEFORE WE ARE LEFT WITH ONLY A BARRIER ISLAND CHAIN TO CONTEND WITH.

ALL-IN-ALL LET ME SUM UP:

THROUGH THESE PROJECTS WE ARE HEADING IN THE RIGHT DIRECTION AND HOPEFULLY WE CAN RESTORE AN AREA WHICH HAS BECOME AS IT IS BECAUSE OF our UNIQUE ABILITY TO HARNESS NATURE. OF THE MILLIONS OF DOLLARS WE HAVE SPENT AND WILL CONTINUE TO SPEND TO CONTROL NATURE, WE HAVE TO BE COGNIZANT OF THE FACT THAT IT WILL TAKE ADDITIONAL MILLIONS OF DOLLARS IN THE WAY OF RESTORATION TO CORRECT WHAT WE HAVE DONE!

and TO REITERATE, THERE IS AVAILABLE DATA WHICH MAY CURTAIL THE NEED FOR ANY EXTENSIVE ADDITIONAL TIME-CONSUMING STUDIES. MUCH OF THAT DATA HAS BEEN DOCUMENTED. AND MUCH, WHICH IS UNDOCUMENTED. THIS VALUABLE UNDOCUMENTED INFORMATION CAN BE FOUND HERE - IN THE HEART, SOULS, AND MINDS OF THE PEOPLE OF PLAQUEMINES PARISH - PROBABLY YOUR MOST IMPORTANT INFORMATION RESOURCE. USE IT!

TERREBONNE PARISH
WATERWORKS DISTRICT No. 1
EAST MAIN AT HOWARD — P. O. BOX 630
HOUMA, LOUISIANA 70361

BOARD OF COMMISSIONERS

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TELEPHONE (504) 879-2495

MILTON LOUVIERE
General Manager

UNA GAUTREAUX
Office Manager

August 27, 1984

Department of the Army
New Orleans District, Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Attention: Colonel Robert C. Lee

Dear Sir:

The primary objective of the Waterworks Districts in Terrebonne Parish is to furnish a continuous supply of potable water to meet the demand of the citizens within the Parish. To meet this objective, the Districts have for many years studied the problem of raw water supply, treatment, and distribution.

The basic conclusion reached is that, ultimately, it is not going to be economically feasible to provide the City of Houma's water treatment plants with a reliable source of raw water.

It should be realized that the City of Houma presently has two (2) water treatment plants; one a 4 MGD plant completed in 1955, and currently approaching 30 years of age, and the second an 8 MGD plant completed in 1968, which is now 16 years of age. With good management and maintenance, these facilities should each achieve a useful life of 40 to 50 years. As these plants have many years of useful life remaining, it makes good economic sense, from the tax-payers point of view, to get the maximum use from these facilities.

With the eventual reduction in the useful life of these plants and a corresponding increase in salt water intrusion into the City of Houma's raw water supply, it is believed that the long term solution is to look to the Terrebonne Parish Waterworks District No. 1 treatment plant, located in Schriever, with a raw water supply from Bayou Lafourche, to meet the total demands of the Parish. There is in existence at the present time, contractural relationships between Waterworks District No. 1 and the Lafourche Fresh Water District for a more than adequate supply of raw water that has provisions to

eventually serve the entire Parish. By making provisions at present to back up the City's plant with an additional source of treated potable water from Waterworks District No. 1, the interim problem of salt water intrusion into the City's raw water source can be managed.

To this end, a Capital Improvement Program is presently being developed for the residents of Terrebonne Parish. If funding can be provided, this program will begin the construction of the trunk main systems necessary to transport water throughout the Parish and includes the initial phase of a back up supply of treated potable water for the City service area.

Equally as important as assuring potable water for Houma, is the problem of maintaining a sufficient and adequate raw water supply for the entire area. With the construction of the levee system along the Mississippi River, river water was cut off at Donaldsonville from Bayou Lafourche and its tributaries. The Lafourche Fresh Water District maintains a raw water flow by siphoning or pumping river water over the river levee and into Bayou Lafourche. This source of raw water services many parishes, municipalities and industries throughout the area.

Salt water intrusion into Bayou Lafourche is indeed a major concern. A wier should be constructed as far south as feasible within Bayou Lafourche to prevent a salt water wedge from encroaching up the bayou and contaminating the primary raw water source for the entire area.

The pump station at Donaldsonville is now 30 years old. In any study of raw water, the Corps should not overlook the need and requirement for the eventual replacement and/or upgrading of the pumping facilities at Donaldsonville.

The prevention of salt water intrusion into Bayou Lafourche and the assured continual nourishment of fresh raw water into Bayou Lafourche at Donaldsonville are certainly two objectives that any study of the Corps, relative to the raw water supply in coastal Louisiana, must address.

WATERWORKS DISTRICT NO. 1

Houma-Terrebonne Chamber of Commerce

1700 South St. Charles Street
(504) 876-5600

P.O. Box 328
Houma, Louisiana 70361

August 28, 1984

Robert C. Lee, Colonel
Department of the Army
New Orleans District
Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Lee:

The Houma-Terrebonne Chamber of Commerce is a voluntary organization of business and professional people who devote their time and energies toward community betterment programs. We represent over 600 employers in Terrebonne Parish whose employees number in excess of 24,700 people, providing a livelihood for approximately 57,580 people among a total parish population of 100,300.

The Chamber of Commerce has for many years voiced concern about the issues of raw water supply, land loss and shore and barrier island erosion. The Chamber therefore is particularly enthusiastic about the involvement of the U. S. Army Corps of Engineers in preparing these Initial Evaluation Studies.

We view each of the topics under consideration: water supply; land loss and marsh creation; shore and barrier island erosion to be complimentary of each other and that their implementation would have a mutual positive impact.

RAW WATER SUPPLY

The Chamber has two basic concerns relative to raw water supply. First is the concern for a raw water supply for potable water needs as addressed in the Initial Evaluation Study. Secondly, is the concern for a source of fresh water for industrial development purposes.

With regards to the first concern, the alternatives mentioned in the

initial report appear to be viable. In addition to these there are possibly other alternatives that should be considered. Examples of these might be as follows:

A) The introduction of fresh water into Bayou Terrebonne at a point southeast of the City of Thibodaux through an open canal or flume, which would accomplish two objectives:

1) A continuing flow of fresh water through Bayou Terrebonne would aid in the beautification and cleanliness of the bayou.

2) A raw water line might be constructed from Bayou Terrebonne above a wier constructed at its intersection with the St. Louis Canal to the existing water treatment plants, thus reducing the cost of the raw water line from Raceland.

B) The construction of a flume from the Lake Palourde or Grassy Lake area into Terrebonne Parish via Big Bayou Black with the ultimate introduction of large quantities of raw water for both potable and industrial use. This might require the construction of an inverted siphon to take the Lafourche-Terrebonne drainage canal under Big Bayou Black and U. S. 90, and a canal along the section line between sections 17 and 18, T17S R15E south of U. S. 90 to its intersection with an existing drainage canal.

C) The possible introduction of water from Bayou Lafourche northwest of the City of Thibodaux into the Terrebonne-Lafourche or the Phillips drainage canals. This alternative might require two additional control structures, one in Bayou Black and one on the new flume at Bayou Lafourche. During periods of high salinity, the existing flood gates on Minors, Elliot Jones and Shell canals, and the new gate on Bayou Black could be closed. The effect of introducing Bayou Lafourche water into this drainage system would have to be evaluated.

The second concern, that of raw fresh water for industrial development purposes, could in part be addressed by either B or C above. In this regard, the area of most potential for industrial development is probably along the Houma Navigational Canal. The Corps' study should address the problem of how to get large volumes of raw fresh water across the Intracoastal Canal and into Bayou Dularge and Bayou Grand Caillou to facilitate industrial development along the canal.

The area of second most potential is probably west of the City of Houma between Big Bayou Black and the Intracoastal Waterway. This area could obtain industrial raw water from Big Bayou Black with proper water use management.

As most of the solutions appear to depend upon water from Bayou Lafourche, the Corps' attention is invited to the existence of the

Lafourche Fresh Water District, which does not include Terrebonne Parish, and the potential problems this situation might present.

SHORE AND BARRIER ISLAND EROSION

During the past 20 years we have witnessed an accelerated rate of erosion along Louisiana's shoreline and the barrier islands which presents a danger to coastal development, to a productive fish and wildlife area, and to numerous recreation activities. The island chains off the Louisiana coast serve as a barrier for the inland coastal area by protecting a very productive and environmentally sensitive marsh complex. As the islands diminish in size we see an increase in saltwater intrusion and a more severe impact of storm tides on our delicate marshlands.

The Corps of Engineers Initial Evaluation Study has identified two (2) plans which are economically feasible. The two recommended plans include plans for Timbalier Island and Isle Dernieres (in Terrebonne Parish) and a plan for Holly Beach and vicinity. We believe the plans for the Terrebonne Barrier Islands as identified in the Initial Evaluation Study have merit which deserve further evaluation. The Houma-Terrebonne Chamber of Commerce supports the Corps in their efforts to conduct a feasibility study of these two plans as well as the other 6 plans which appear to be sound.

LAND LOSS AND MARSH CREATION

The Initial Evaluation Study by the Corps confirms that land loss is a serious problem throughout the coastal zone and Terrebonne Parish is no exception. We cannot over emphasize the economic value of our marshes and swamps for the fishing industry, for industry, recreation and the valuable mineral resources which lie beneath. In addition this area enables us to develop and maintain waterborne commerce, provides fresh drinking water and protection from storm tides.

The Corps has identified the causes, magnitude and adverse economic impact which results as the wetlands vanish. your search for possible solutions you have identified methods to use in plans to combat land loss. The two methods which you found to be economically feasible are by creating marsh with material from maintenance dredging of existing navigation channels and diversion of sediment laden water from the Mississippi river. We support your efforts to develop more detail on these two possible solutions to land loss.

In summary, the Houma-Terrebonne Chamber of Commerce feels that the Corps of Engineers has identified very viable methods

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In summary, the Houma-Terrebonne Chamber of Commerce feels that the Corps of Engineers has identified very viable methods

which have the potential to protect and improve our fresh water supply, to reduce land loss and to control erosion along our shoreline and barrier islands. We also support your recommendations that additional studies are needed before any of these plans are implemented.

We appreciate having had the opportunity to submit our views on the subject of this hearing and we extend our cooperation in pursuit of solutions to these complex issues.

Yours very truly,

Kenneth Watkins
President

KW/kb

ACADIA PLANTATION
P O. BOX 110
THIBODAUX, LOUISIANA 70302

August 31, 1984

Col. Robert C. Lee
Corps of Engineers
District Engineer
New Orleans District
P. O. Box 60267
New Orleans, Louisiana 70160

C-7.1

Dear Sir:

As a private citizen, with no special representation, I attended the Corps' public meeting held in Houma, Louisiana, on August 28. The meeting was of great interest to me, partly because of my appreciation for and enjoyment of the uniqueness of our coastal areas and partly because of my residence on the banks of Bayou Lafourche, a distributary stream which was included as part of the discussions at the meeting.

I wish to offer some comments for the record both on general and specific bases.

As a general matter, it appears to me from the discussions which were held at the meeting that the various projects which were being discussed (and another which was not discussed in depth but which involves fresh water diversion to the Barataria and Breton Sound Basins) are being studied without adequate concern for inter-relationships. There appears to be a strong need for these studies to become part of a total management approach to the coastal zone area and even a possible rethinking of the coastal zone boundaries to include fresh water sources which may lie north of those present boundaries.

A surprising, almost comical, example of such a need for coordination was the recommended plan for fresh water reservoirs for Davis Pond and Big Mar, at the exact points where fresh water diversions to the Barataria and Breton Sound Basins were recommended under a previous study. It was apparent from the meeting and from the Corps' reports that those two projects - the diversion project and the fresh water reservoir project - would conflict in many ways.

Close to home, I am concerned about the water supply problems which were addressed in relation to Houma's needs but which would involve diversion of fresh water from Bayou Lafourche. Already, Terrebonne Parish takes a great amount of fresh water from Bayou Lafourche, which is presently suffering from serious salt water intrusion as far north as Lockport but noticeably also up to Thibodaux at certain times. How would increased use of Bayou Lafourche water be made possible?

It would appear that no one yet has addressed the need for a radical change in the hitherto conventional thinking of allowing Bayou Lafourche to become a drainage canal, non-navigable, with settlement allowed down to, and in some cases out into, the water, with fixed bridges on pilings where bridge crossings are built, and with no dredging of silt. If Bayou Lafourche is so crucial to the fresh water supplies for communities within the Lafourche basin, should not the Corps of Engineers also consider the feasibility of and need for a small diversion project at Donaldsonville? Should there not be a consideration of resumption of navigation along northern Bayou Lafourche, not only to provide for maintenance of the depth of the Bayou but also to make possible the economic diversity resulting from navigation? Should there not be some exploration of the possibilities of using Bayou Lafourche for additional fresh water diversion into marshes south of Raceland, where salt water intrusion is becoming a serious problem?

Further extensions of the problems, which were not fully discussed at the meeting, are those of drainage. I am an owner of property which straddles the Bayou Folse Watershed at its northern end. We frequently hear complaints of the inability of this watershed to carry run-off which has been caused by improved agricultural practices or urbanization. Those in-the-know are aware that one cause of the problem is silt blockage at the discharge areas of this watershed, namely at Lake Fields and areas below. Is the Gulf's intrusion adding to the problem? Might such drainage facilities be utilized to assist in stemming the salt water intrusion and marsh losses? Similar questions are valid on the left descending bank of Bayou Lafourche, where Grand Bayou, Bayou Boeuf, and other streams drain the Chackbay and Lafourche ridges.

I thank you for your consideration.

Sincerely,

David D. Plater

DDP/dj

cc: Congressman Billy Tauzin
Senator J. Bennett Johnston
Senator Russell Long

September 10, 1984

Colonel Robert C. Lee
District Engineer
New Orleans District
Corps of Engineers
P. O. Box 60267
New Orleans, LA 70160

Dear Colonel Lee:

The Greater Lafourche Port Commission would like to commend the Corps on studies of Water Supply, Land Loss and Marsh Creation, and Shore and Barrier Island Erosion. We believe that these problems are paramount to Louisiana and this nation, and strongly urge further action by the federal government.

The Commission would like to make several comments concerning these very important studies.

As I and several others stated at the public hearing held in Houma, parameters used to determine the cost-benefit ratio needs to be examined. I have not had the opportunity to review exactly how these ratios were determined, but this Commission feels the Port Fourchon beach area has been delt a great injustice by the cost-benefit ratio determined in the study. Port Fourchon has developed into a strategic multi-use port that has local, state and national significance (see enclosed brochure). Over a billion dollars is invested there. Beach stabilization is a must in protecting this thriving port. The recreational usage of beach area is phenomenal since it is one of the few beaches in this state that had road access. This road access is being threatened by the Gulf today and will no longer be available unless something is done immediately. The Greater Lafourche Port Commission strongly urges the Corps to re-evaluate the cost-benefit ratio of stabilizing Fourchon Beach, especially the immediate area fronting the port and road access.

In the water supply study, Grand Isle was considered a problem area. We urge that the Corps work very closely with the Lafourche Parish Fresh Water District in its further studies. Port Fourchon is also on the same water line as Grand Isle and its water needs are tremendous and barely being met by the District. Importing 700,000 gallons a day from Leeville would affect the Port greatly and would not be practical. It is also my understanding that the weak link in getting water to the south end of the parish is in the Golden Meadow area and a larger line to Leeville from Grand Isle would not benefit.

Greater Lafourche Port Commission · P.O. Drawer 728 · Galliano, La. 70354 · (504) 632-6701

The Commission strongly supports the Davis Pond Freshwater Diversion Project and opposes any alternative that would convert it to a storage reservoir or otherwise interfere with freshwater diversion into the Barataria Basin.

The Commission strongly supports prevention of land loss and marsh creation projects. We believe a project similar to the Grand Isle Beach project should be initiated at Port Fourchon before beach access is lost and the Port itself jeopardized.

If this Commission can be of any assistance to you in these projects, please do not hesitate to contact us as we are very interested in the future of our coastal zone.

Yours very truly,

Ted M. Falgout
Executive Director

TMF:lad
Enclosure

Louisiana Wildlife Federation, Inc.

P.O. BOX 16089 LSU
BATON ROUGE, LOUISIANA 70893
504/355-1871

September 5, 1984

New Orleans District
U.S. Army, Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Attn. Planning Division
Regional Planning Branch

re: Study Findings - Water Supply, Land Loss and Marsh Creation, and Shore and Barrier Island Erosion in the Louisiana Coastal Area

Dear Sir:

We submit these comments for the record of the meetings held last month concerning the captioned subjects. The Louisiana Wildlife Federation is the largest non-government conservation organization in the state with 80 local affiliate sportsmens groups and over 7,000 members. Well over half of our members reside in or within a short drive of Coastal Louisiana and utilize its resources for both commercial and recreational purposes. Thus we are vitally interested in any proposals intended to halt further deterioration and/or restore losses of coastal resources.

The effort the Corps ofEngineers has made to identify the problems in Coastal Louisiana, the causes and solutions, is commendable. Certainly the Louisiana Wildlife Federation, in general, supports all proposals to restore wetlands, improve water quality and offset beach and barrier island erosion. Particularly with regard to the study of Land Loss and Marsh Creation, however, more emphasis should have been directed toward treating the cause of the problem rather than compensating for the effects.

WATER SUPPLY

The rationale for Corps involvement in studying solutions to the water supply problems of Grand Isle and the River Parishes is not clear to us. The suggestion that the ongoing planning for freshwater diversion to the Barataria and Breton Sound Basins be complicated with provision for emergency water supply for the River Parishes is unacceptable. The justification for such an emergency supply is given in the study as a serious pollution event on the Mississippi River contaminating the existing supply source. We submit that the solution is to provide adequate pollution control regulation and enforcement to keep the River water acceptable for public supply use, not construct an alternate source that could likely compromise the benefits of much needed freshwater diversion.

The cause of the water supply problem in the four other problem areas is attributable to some extent to contamination of existing supply by encroaching saltwater. The maintenance of navigation channels such as the Calcasieu Ship Channel, Gulf Intracoastal Waterway, Houma Navigation Channel and Lower Mississippi River has contributed in varying degrees to the problem, along with over-pumping, waste, and municipal and industrial pollution.

The Houma Navigation Channel (HNC) presents a particularly severe problem. Saltwater conducted by this channel has devastated surrounding swamp forest and marshland. Though the Corps report dismisses construction of a saltwater barrier in the channel as too risky because of disruption in the movement of marine organisms, we suggest that every effort should be made to stop this saltwater problem for both water supply and land loss considerations. The impact of the HNC on surrounding wetland habitat is startling and deplorable.

SHORE AND BARRIER ISLAND EROSION

As funds are made available, we support the implementation of erosion plans for all eight problem areas studied by the Corps, with the priority based on significance of resources protected and benefit/cost ratio.

LAND LOSS AND MARSH CREATION

We are pleased to see the Corps acknowledge the major causes of land loss in the coastal zone, including various purpose canal dredging and flood control and navigation works on the Mississippi River. We emphatically concur with the Corps' evaluation that marsh creation using the maintenance dredging spoil from 8 major navigation channels should be pursued. We also support further consideration of controlled and uncontrolled Mississippi River diversions and use of Mississippi River sediments to bolster subsiding marshes.

There seems, however, to be an obvious oversight in this study. Though the Corps accurately attributes land loss, at least partially, to man's activities, particularly canal dredging and maintenance for navigation and access, it does not suggest any remedies directed toward these problem sources. Backfilling or removal of spoil that impedes freshwater flow through the marsh, plugging of canals, better coordination of activities so as to minimize adverse impacts - all would serve to reduce the rate of wetland deterioration.

Coastal Louisiana is suffering from the cummulative impacts of thousands of public and private projects undertaken, for the most part, without regard for the hydrology of the natural systems that created it. Every effort should be made to mitigate the impacts of previous and existing projects and activities, public and private, and future activities should be planned so as not to further disrupt these important wetland ecosystems, with particular attention paid to the natural hydrology at each project site.

That concludes our comments. Thank you for the opportunity to participate.

Sincerely,

Virgil J. Bourque, Jr.
President

VJBJr/sp
cc: Hon. Russel Long
Hon. J. Bennett Johnston
Hon. Robert Livingston
Hon. Lindy Boggs
Hon. Billy Tauzin
Hon. John Breaux
Members, LWF Wetlands Committee

28 Aug 84

BOLD NEW DIRECTION FOR HOUMA NAVIGATION CANAL

Recently, while staying overnight in New Iberia, I happened to read the local newspaper detailing their $500,000 state appropriation for the Port of Iberia. The appropriation will be used to create a barge loading/unloading facility to promote international and interstate trade. This prompted some mental exercises about what we could do to get our port off of the drawing board and lay some groundwork for new, diverse directions for our economy based around the Houma Navigation Canal. Therefore, this article/proposal is being written to provoke discussion as well as provoke action on our port, undoubtedly our most underutilized asset.

The first and most important problem one must address when analyzing our navigation canal is salt water intrusion, past, present, and future. My proposed solution is to construct a large lock just south of Cocodrie to prevent salt water intrusion. This lock could be used to raise the fresh water level in the Navigation Canal, causing fresh water to divert into some of the connecting bayous such as Grand Caillou and Bayou Sale.

To cost justify and pay for such a lock, the Navigation Canal needs to be deepened to 40-45 feet to allow for ocean freighter traffic. The user fees could be scaled to the size of the vessel to prevent undue hardship on smaller fishing vessels or the like (the smaller boats would have access via Bayou Sale or Grand Caillou). The deep water port could then be marketed as an alternative to New Orleans and Lake Charles, particularly in Trans-Modal shipping utilizing the inland waterways and barges. It is common knowledge that the Port of New Orleans is vulnerable to competition due to out moded material handling technology and uncompetitive labor costs and work practices. Our new port could embrace state of the art material handling technology and possibly remain non-union. Secondily, our port could attract process industries who need petroleum feedstocks, natural gas, and/or plently of fresh water in conjunction with deep water access to our inland waterways.

The third segment of this proposal is to provide our barrier islands with fill material. A rock jetty should be built from the lock out into the Gulf of Mexico, with cross accesses within Terrebonne Bay. Firstly, the jetty within the bay would reduce some of the dynamic action of the water that currently is eroding the North and South shore of Terrebonne Bay. Secondily, the rock jetty jutting out into the Gulf would protect the leeward side of the barrier islands. In conjunction with the rock jetty, a permanent pipeline would be laid along side of the jetty to the

barrier islands. The Corps of Engineers would determine how far north one would go with the pipeline before the fill is unacceptable. The pipeline would have flanged openings every few thousand feet so that the dredging operators in the channel can tie into the pipeline and move the material out to the barrier islands. At that point, a movable boom discharge line would be used to spot the fill material where it is needed. With a normal pipeline life of 20 years, we could have a permanent source of replacement material for our barrier islands while maintaining channel depth. Because of depressed activity in the natural gas market (the industry is centered around Houma) it is probable that a line could be built near costs in today's market.

The only environmental problem is disposing of the spoil material in the northern half of the canal. Here again, we propose building a second pipeline (or a continuam of the first) with flanged openings. The port commission could acquire approximately 100 acres (of minimal enviromental damage) and use as the spoil receptacle. Then, the port commsission could divide it into sections and sell the dirt to dirt contractors as it is similarly done today on a smaller scale. The revenue generated from the sale of this quality top soil would be used to offset some of the expenses of this operation.

In effect, the Naviagation Canal would be one big re-cycling machine, nourishing our barrier islands as well as preventing salt water intrusion. New industry would be created as well as user fees would be generated from the locks. It is my sincere belief that only a project centered around large scale economic benefits can pay for projects required to reverse the environmental damage done to lower Terrebonne Parish. A project of this scale would also lay the foundation for a prosperous economy for our children and their children.

The time for us to act on our deep water port in now. When the oil is gone; and Cocodrie is an island; and Dulac is the beach; and the shrimp and oyster industries severely depressed; and Houma has no fresh water; it will be too late. We must act now and boldly to protect our good earth.

D. Keith Rhea

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

October 1, 1984 F/SER112/PK/JL:gog
409/766-3699

Colonel Eugene S. Witherspoon
District Engineer, New Orleans District
Department of the Army, Corps of Engineers
P. O. Box 60267
New Orleans, LA 70160

Dear Colonel Witherspoon:

This is in reference to the three July 1984 Notices of Study Findings (Notices) and the Announcment of Public Meetings by the Corps of Engineers (Corps) for the Louisiana Coastal Area Study initial evaluations of Water Supply, Land Loss and Marsh Creation, and Shore and Barrier Island Erosion. Alternatives are discussed in each Notice. The National Marine Fisheries Service (NMFS) has reviewed the Notices and offers the following comments for your consideration.

We feel that the lack of sufficient freshwater and sediment inflow to sustain the coastal marshes is among the most serious marine fishery issues facing the Louisiana coast. Without sufficient freshwater and its accompanying sediment supply, wetlands will continue disappearing at an ever increasing rate beyond the most recent estimate of 32,000 acres per year, or over 3 acres per hour. Measures such as those proposed in these Notices should be studied and the most beneficial ones implemented as soon as feasible in order to stem the loss of wetlands.

Regarding the Water Supply proposals, one of the alternatives for the Houma area typifies the present conditions causing marsh loss. The Houma Navigation canal, according to the Notice, has allowed saltwater intrusion into the area marshes and jeopardized the fresh water supply for Houma. However, the Notice then states that the Corps has ruled out a saltwater barrier in that navigation canal because a barrier "poses some serious environmental problems", in that it would "create a barrier to the transport of estuarine-dependent fish and shellfish species." Nevertheless, we believe that a saltwater barrier could be designed to allow for continued ingress and egress of estuarine-dependent organisms while still minimizing salt water intrusion and allowing navigation. Therefore Plan 6, or a modification of it, to prevent the excessive saltwater intrusion should not be excluded but should be retained for more detailed study.

The NMFS is concerned that Plans 13 and 14 for the River Parishes, which the Corps recommends be retained for more detailed study, could eventually be in direct conflict with the intended diversion of freshwater into the marshes as proposed by the Corps in another part of the Louisiana Coastal Area Study. Plan 13 or 14 could cause delay(s) in the construction, and/or conflict in the operation of, facilities that would divert the direly needed freshwater flows to benefit the marshes of Lafourche, Jefferson and Plaquemines Parishes. When previously commenting on those two proposed freshwater diversion projects, the

NMFS emphasized that the facilities and easements should be sufficient for any later increase of freshwater inflow needs. In addition to placing conflicting operation demands upon the water diversion structures, the reservoirs would remove some wetlands. Plan 12 also would destroy some wetlands as presently described in the Notice. In view of the above, the NMFS recommends that Plans 12, 13, and 14 be eliminated from further study.

Increased adverse impacts to estuarine-dependent fishery species would occur from Plans 24, 25, and 26 by blocking or further restricting access by those species that are currently allowed to access the Grand and White Lakes area and by causing even further adverse impacts to the area marshes with elevated water levels. Therefore, the NMFS recommends that Plans 24, 25, and 26 be eliminated from further study.

In regard to the Land Loss and Marsh Creation proposals, NMFS supports the alternatives suggested to preserve and enhance the dwindling coastal wetland resources. Two procedures, (1) diverting a portion of the 189 million tons of sediment carried by the Mississippi River each year and (2) placing dredged materials to elevations conducive to the establishment of marsh vegetation, should restore some marshes and retard erosion. We therefore endorse the Corps' proposal that these alternatives be investigated in further detail.

Concerning the Shore and Barrier Island Erosion proposals, the barrier islands are a thin but effective outer barrier of defense against the estuaries becoming open Gulf waters. These barrier islands must continually have sediment replenishment to endure. Various stabilization methods such as beach nourishment and dune construction, revetments, breakwaters, and revegetation are intermediate measures that slow the erosion and subsidence processes caused by lost sediment nourishment. Implementation of such stabilization plans, is necessary to prevent the erosion and/or disappearance of the eight areas specified in the Shore and Barrier Island Notice. The only exception to the general coastal erosion occurring in Louisiana is the area being sustained and accreted by sediment flows from the Atchafalaya River complex. Thus, the NMFS supports plans to protect the barrier islands, peninsulas and beaches that separate the open Gulf from the nation's largest assemblage of complex estuarine systems that are so vital to marine fishery resources.

In summation, the NMFS supports study completion and implementation as soon as possible of those plans that would prevent or retard the increasing estuarine losses of the Louisiana coast. We also believe the barrier island protection could be enhanced with additional freshwater inflows to transport sediment. Finally, we reiterate that Water Supply Plans 12, 13, 14, 24, 25, and 26, which we believe would cause adverse environmental impacts to marine fishery resources, should be eliminated from further study.

Thank you for the opportunity to review the study findings.

Sincerely yours,

for Richard J. Hoogland
Chief, Environmental Assessment
Branch

Lafourche Parish Water District No. 1

P.O. BOX 399
LOCKPORT, LOUISIANA 70374

AREA CODE · 504
PHONE 532-7538

September 28, 1984

Colonel Robert C. Lee, District Engineer
Department of the Army
New Orleans District Corps of Engineers
Post Office Box 60267
New Orleans, Louisaina 70160

Dear Colonel Lee:

We have reviewed the Notice of Study Findings prepared by the U.S. Army Corps of Engineers regarding water supply, specifically Grand Isle, as well as listened to comments made at the August 28, 1984 public meeting held in Houma, Louisiana.

The Lafourche Parish Water District No. 1 is currently working on a major expansion program, of which much of the construction work has already been completed, to satisfy the estimated demands to be placed on our system up to the year 2000.

The phases of this program which have been completed thusfar, have proven extremely beneficial in bringing additional water to the problem areas within our parish, some of which are Leeville and Fourchon in the South Lafourche area. Since Grand Isle receives water from Lafourche at Leeville, these improvements allow us to deliver additional water to Grand Isle.

We are not in a position just yet to determine how much more water, above the 500 M gallon per day contract amount, can be delivered currently or in the future once the remaining projects are completed.

I feel sure that the Board of Commissioners will insist that the current thirty year contract between Lafourche Parish Water District No. 1 and the Town of Grand Isle be renegotiated or amended before additional contract amounts can be committed by this District.

We will be happy to discuss all these matters in more detail.

Please feel free to call on us in the future.

Yours truly,

LAFOURCHE PARISH WATER DISTRICT NO. 1

Eldon J. Breaux

Eldon J. Breaux, General Manager

EJB:egf

cc: Board of Waterworks Commissioners

United States Department of the Interior
NATIONAL PARK SERVICE
SOUTHWEST REGION
P.O. Box 728
Santa Fe, New Mexico 87501

IN REPLY REFER TO:

L7619(SWR-PE)

OCT 5 1984

Colonel Eugene Witherspoon
District Engineer
New Orleans District
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Witherspoon:

We have received Notices of Study Findings for three Louisiana Coastal Area Studies: Water Supply, Shore and Barrier Island Erosion, and Land Loss and Marsh Creation. We are supplying the following comments to you on a technical assistance basis.

Regarding the Water Supply Study, the study has identified six water supply problem areas. Of these, four are of immediate concern to the National Park Service (NPS) affecting communities and the ecological systems which support them as part of the delta region. Under the provisions of Public Law 95-625, November 10, 1978, which created Jean Lafitte National Historical Park, the NPS is concerned with the preservation of the natural and historical resources of the delta region. We recognize the need for long-term planning and implementation of programs to meet the freshwater needs of the people of the delta region, and we applaud this preliminary study.

Any freshwater delivery system, however, should be designed in such a way as to disrupt the natural wetland ecosystem, so vital to the delta's unique cultural heritage, as little as possible. The deterioration of this ecosystem and threats to its future viability have been amply documented, and the need for remedial solutions to these problems is recognized by the Corps. We are especially concerned, therefore, with the proposal to use the Davis Pond Freshwater Diversion to create a reservoir at the expense of 7,425 acres of freshwater marsh. Not only would such a project undo much of the good which is anticipated to accrue from the diversion project, but it would directly affect the important Barataria estuary, and deplete the watershed of the Barataria Unit of Jean Lafitte National Historical Park.

Regarding the Land Loss and Marsh Creation and Shore and Barrier Island Erosion Studies, no more critical threat to the integrity of the historical and natural resources of the delta region exists than the loss of marsh, swamp, and barrier beaches to erosion caused by man-made alterations to the environment. We encourage the Corps to aggressively pursue regulatory and structural measures which will help slow this catastrophic deterioration. It is important that

research be funded to establish the true value, economic, social, and otherwise, of the wetlands being lost. In this way, the Corps' cost/benefit ratios, which they recognize are based on inadequate data, can be re-evaluated, and the public and its governmental representatives be given a more accurate assessment of the problems and the true costs and benefits of solutions.

We appreciate the opportunity to provide these comments.

Sincerely,

Eldon G. Reyer

Associate Regional Director,
Planning and Cultural Resources,
Southwest Region